AD NUMBER

AD829263

NEW LIMITATION CHANGE

TO

Approved for public release, distribution unlimited

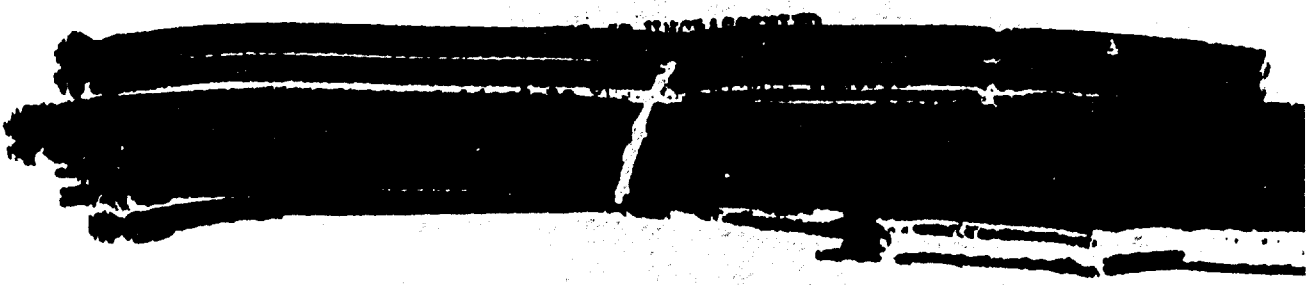
FROM

Distribution authorized to U.S. Gov't. agencies and their contractors; Administrative/Operational Use; 22 MAY 1964. Other requests shall be referred to Space and Missile Systems Organization, Los Angeles, CA.

AUTHORITY

SAMSO USAF ltr, 28 Feb 1972

[redacted]



[redacted]

GDDDDD

GENERAL DYNAMICS
ASTRONAUTICS

[redacted]

A2136-1 (REV. 6-61)

DYNAMICS TEST LABORATORY

~~CONFIDENTIAL~~ UNCLASSIFIED

22C 64-067
REPORT NO. FR-27C-3484
DATE 22 May 1964
NO. OF PAGES 49

GENERAL DYNAMICS | ASTRONAUTICS

FR-27C-3484

ATLAS MISSILE

B-2 POD - AIG SECTION

DEVELOPMENT PROGRAM FOR THE REDUCTION

OF ACOUSTIC LEVELS IN THE ARMA COMPUTER

STATEMENT #2 UNCLASSIFIED

This document is subject to special export controls and each transmittal to foreign governments or foreign nationals may be made only with prior approval of ... SMSD

PREPARED BY H. L. Smith
H. L. Smith

APPROVED BY E. J. Campbell
E. J. Campbell

CHECKED BY G. H. Bosco
G. H. Bosco

APPROVED BY M. C. Brady
M. C. Brady, Group Engineer
Dynamics Test Laboratory

Classification Changed to:
UNCLASSIFIED
Authorized by: WSMR-1 Date 7/10/63
D D 254
Reclassified by Bradfield Dept 130-1 Date 5/12/64

REVISIONS

NO.	DATE	BY	CHANGE	PAGES AFFECTED

UNCLASSIFIED
~~CONFIDENTIAL~~

NOTICE

When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder, or any other person, or corporation, of conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

This document contains information affecting the National Defense of the United States within the meaning of the Espionage Laws, Title 18, USC, Sections 793 and 794. Its transmission on the revelation of its contents in any manner to an unauthorized person is prohibited by law.

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

1.0 INTRODUCTION:

An acoustic test program was conducted on the AIG section of the B-2 pod of an Atlas Missile from 22 January 1964 to 24 March 1964 in the Reverberant Chamber of the General Dynamics Acoustic Laboratory. The test program consisted of a series of noise reduction tests to establish the effectiveness of various acoustic modifications to the AIG pod and the ARMA computer. Each of the modifications was assessed as to its contribution in reducing the noise energy level at the diodeit circuit boards in the ARMA computer. A noise reduction at the circuit boards of at least 10 decibels below the "baseline" configuration for all frequencies from 300 to 10,000 cps was desired. The "baseline" configuration consisted of two inch thick Gustin Bacon "300" fiberglass completely lining the interior surfaces of the AIG pod per drawing 27-73669.

The purpose of the Acoustic Test Program was to establish an improved operational pod configuration to obtain this additional noise reduction in the ARMA computer.

2.0 SUMMARY OF RESULTS:

The results of the AIG pod acoustic investigations indicate that a significant noise reduction (approximately 10 db over the frequency range of 300 to 10,000 cps) over the present operational pod configuration may be obtained with a modified pod configuration. These AIG pod configurations with their respective noise reduction at the circuit boards in the ARMA computer are tabulated in the table of Figure 2.

3.0 SPECIMEN:

The AIG section of the B-2 pod from an Atlas missile, P/N 27-60036-857, serialized for Atlas Missile 124F, was used during the Acoustic Test Program.

All testing was performed with the following three units in place within the pod:

a. ARMA Computer
b. ARMA Platform
c. ARMA Guidance Package

Several tests were conducted with the following additional equipment added to the pod:

3.0 SPECIMEN: (Contd)

a. GD/A R & D Antenna
b. ARMA Analog Signal Converter
c. ARMA Digital Signal Converter

The interior of the AIG pod was modified and altered numerous times during the program of testing. These various configurations are tabulated in Figure 2.

4.0 TEST SETUP:

In preparation for the "baseline" test, the pod was lined with fiberglass per drawing 27-73669. The "baseline" configuration consisted of the pod interior completely lined with 2" Gustin Bacon Utralite "300" fiberglass and the operational ARMA equipment installed in the pod. The fiberglass lining of the pod is shown in Photographs 1, 2, 3, 4 and 5. In the "baseline" configuration, the pod was mounted in a horizontal position on a laboratory test fixture. The test fixture was constructed to simulate the exterior curved surface of an Atlas missile. The AIG pod mounted on the test fixture was then positioned in the Reverberant Chamber at the Acoustics Laboratory in preparation for testing. An end and side view of the pod mounted on the test fixture are shown in Photographs 6 and 7.

A test of the reverberation characteristics of the Reverberant Chamber indicated that a sound field generated in the chamber, with the AIG pod on the test fixture, was uniform for all octave bands except the first. Therefore, no data was recorded for the first octave band.

During this Acoustic Test Program a reverberant sound field was produced in the Reverberant Chamber by means of electro-mechanical acoustic transducers. The noise field was obtained from a random noise generator, filtered into octave bands, amplified, and used to drive the loud-speaker units. Four enclosed Altec loud-speaker units were suspended in each corner approximately four feet from the ceiling and three feet out from the corner. Four University horn-type speakers were placed on the floor in each corner, approximately one foot from the corner. All speaker units were directed into their respective corners to prevent the pod from being exposed to the direct sound field. Two of the enclosed speakers and one horn speaker are shown in Photograph 8. A block diagram of the system used to produce this sound field is shown in Figure 1. The sound pressure levels generated in the Reverberant Chamber throughout the test program ranged from 100 to 120 db over the octave bands and were great enough that the sound level monitored in the ARMA computer was always at least 10 db above the ambient noise floor.

4.0 TEST SETUP: (Contd)

Acoustic sound levels were measured during the testing with three condenser microphones. The output of each microphone was amplified, filtered into 1/3 octave bands or octave bands and read on a db meter. A block diagram of the sound level monitoring system is shown in Figure 1. The instrumentation used for monitoring the microphones during testing is shown in Photograph 9. The microphones used for this test program exhibited substantially identical calibration characteristics and correction factors were added when necessary. The microphones with their locations which were maintained throughout the test program were as follows:

a. Reverberant Chamber Microphone - Western Electro-Acoustic Laboratory Type 640AA, centrally located in the chamber suspended approximately two feet above the AIG pod.

b. Pod Microphone - Western Electro-Acoustic Laboratory Type 640AA, centrally located in the AIG pod in the area between the ARMA computer and ARMA platform.

c. Computer Microphone - Brueil & Kjaer Type 4132, located in the ARMA computer in the area normally occupied by the Target Constants Board No. 1.with a blank cover closing the front opening.

The three microphones are shown in their respective positions in Photographs 10 and 11.

5.0 TEST PROCEDURE:

Immediately following the installation of the AIG pod and test fixture in the Reverberant Chamber, an investigation was made for the existence of standing waves between the pod and the test fixture. Using a microphone, the area between the pod and the test fixture was surveyed while a reverberant sound field was generated in the Reverberant Chamber. No standing waves were observed at any time during this test.

Following the standing waves survey; a "diagnostic" test was made to pinpoint all sources of acoustic leaks into the interior of the pod. Investigation for the acoustic leaks was made on the inside of the sealed pod using a microphone and a stethoscope with a noise field generated in the Reverberant Chamber. The results of this "diagnostic" test indicated that the greatest source of acoustic leakage, other than

5.0 TEST PROCEDURE:

through the pod air conditioning intakes and exhaust, was due to the improper seal of the pod doors with the pod.

Next, a series of noise reduction tests were conducted on the pod, beginning with the "baseline" configuration; to obtain data necessary to establish a practical design for an operational pod with additional noise reduction inside the ARMA computer. These tests investigating the effectiveness of various acoustical modifications to the pod, are listed in the table of Figure 2 (Test No.'s 1.1 through 6.1) referenced to the corresponding pod configuration used.

Following Test 3.9.2, the fiberglass was entirely removed and the forward half of the pod was relined with open cell polyurethane foam, American Latex Spec. S620-D, with lead backed vinyl. Stabond adhesive, American Latex Spec. T161 (for bonding foam to metal), Stabond adhesive, American Latex Spec. C139 (for bonding vinyl to metal surfaces) and EC 1300 (for bonding foam to foam) was used for the installation of the foam in the AIG Pod. The lead backed foam was installed in 1 inch sheets with the lead vinyl back-to-back. Views of the pod lined with this foam are shown in Photographs 12, 13, 14 and 15.

In the table of Figure 2 the various configurations labeled OP. indicate it is the operational configuration in use on the present Atlas Missiles. The data tabulated in Figure 2 for noise reduction is the reduction of sound level in decibels from the Reverberant Chamber environment to inside the ARMA Computer for each octave band.

The four muffler configurations used for this series of tests are listed below:

(1) Operational - The muffler configuration now being used in the Atlas Missiles.

(2) Revision No. 1 - The operational muffler with the interior lined with 1/2" foam.

(3) Revision No. 2 - The operational muffler with the interior lined with damping tape No. 428C.

(4) Taped Muffler - The operational muffler with the exterior taped with damping tape No. 428C.

5.0 TEST PROCEDURE: (Continued)

The R & D antenna configuration, shown in Photograph 5, is the antenna used for research and training flights; while the operation antenna door, shown in Photograph 7 is employed on operational Atlas Missiles.

The computer cover which completely enclosed the computer consisted of a "tub" (reference Photographs 16, 17 and 18), three sides and a bottom (reference Photographs 19, 20 and 21).

The complete cover was made from sheet aluminum with one inch of foam glued to the metal. The fourth side of the enclosure consisted of a bulkhead. The bulkhead was also made of aluminum covered with one inch of foam. Tests were conducted using three bulkheads with the only appreciable difference being that each was slightly larger than the previous. For bulkheads No. 1, 2 and 3 refer to Photographs 19, 20 and 21 respectively.

Two slightly different configurations of inline muffler were incorporated during testing. In Photograph 22 inline muffler No. 1 is shown on the right and inline muffler No. 2 is shown on the left. The inline mufflers were placed in series with the operational muffler (reference Photograph 23).

Noise leaks through the pod air conditioning exhaust were attenuated using exhaust baffles. A metal baffle, designated exhaust baffle No. 1 (reference Photograph 24) and a polyurethane baffle designated exhaust baffle No. 2 (reference Photograph 25) were tested.

In addition to the bulkhead mounted aft of the computer, a bulkhead was mounted on the pod door to complete the effect of a separation between the forward and aft sections of the pod. Two door bulkheads were used with the only appreciable difference being the second was slightly larger. Door bulkhead No. 1 is shown in Photograph 26.

The ARMA Computer was tested in the following three configurations:

(1) Operational - The configuration of all ARMA Computers presently in operation in the Atlas Missiles.

(2) Tarred - A black rubbery substance covering the entire external cover of the computer (reference Photograph 27).

(3) Taped - The external sides of the computer covered with damping tape No. 428C (reference Photograph 28).

6.0 TEST RESULTS:

The noise reduction in the ARMA Computer is tabulated in octave bands in Figure 2, and the results of the different configurations may be readily compared. Figure 3 shows graphically a comparison in noise reduction in the ARMA Computer with the "baseline" or operational configuration (Test 1.1) and noise reduction in the computer with the complete computer enclosure installed(Test 2.0). A comparison of the noise reduction characteristics of full pod lining with fiberglass (Test 1.1) and half pod lining with fiberglass (Test 3.6b) are displayed in Figure 4. The graph in Figure 5 indicates a comparison in noise reduction with the pod lined with fiberglass (Test 3.6b) and the pod lined with foam (Test 4.0). With all other conditions the same, Figure 6 shows a comparison of the ARMA Computer tared (Test 5.3) with the ARMA Computer taped (Test 6.1).

7.0 TEST EQUIPMENT

	Item	Manufacturer	Type	S/N
1.	Microphone	W.E.A.L.*	640AA	1419
2.	Microphone	W.E.A.L.	640AA	2009
3.	Microphone	Bruel & Kjaer	4131	42096
4.	Pre-Amplifier	W.E.A.L.	D	774
5.	Pre-Amplifier	W.E.A.L.	D	775
6.	Pre-Amplifier	W.E.A.L.	D	776
7.	Condenser Microphone Complement	W.E.A.L.	100E	228
8.	Dual Channel Record-Analyzer	W.E.A.L.	1200-A	103
9.	Audio Frequency Spectrometer	Bruel & Kjaer	2109	22589
10.	Octave Band Analyzer	General Radio	1550-A	913

7.0 TEST EQUIPMENT: (Continued)

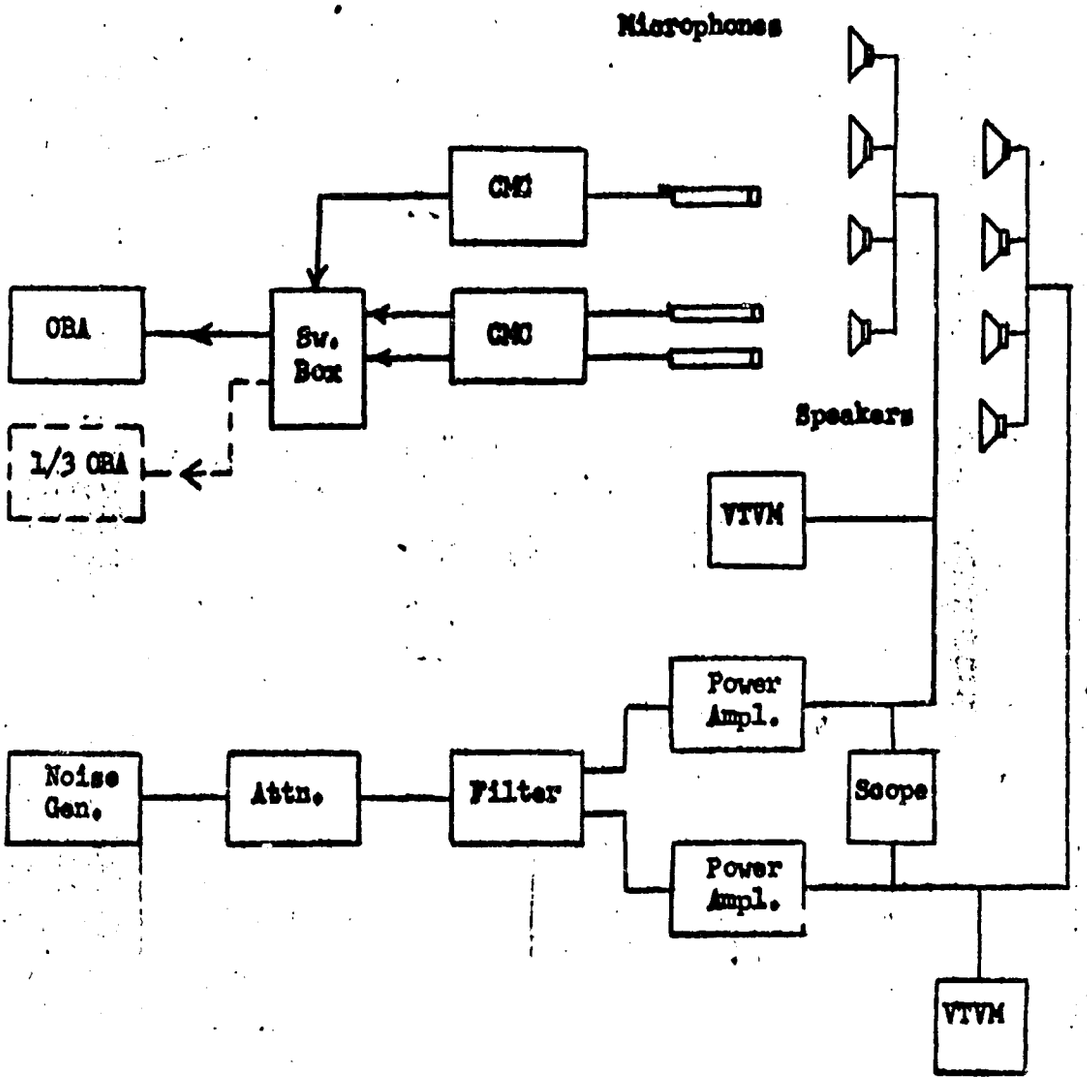
	Item	Manufacturer	Type	S/N
11.	Random Noise Generator	Scott	811-A	407
12.	Attenuator Set	Hewlett-Packard	350D	220-00941
13.	Octave Filter	W.E.A.L.	500B	131
14.	Power Amplifier	McIntosh	MI200A	"
15.	Power Amplifier	McIntosh	MI200A	667
16.	Electronic Voltmeter	Ballantine	310A	409D
17.	Electronic Voltmeter	Ballantine	310A	5021
18.	Oscilloscope	Tektronix	"	"
19.	Speaker	Altec	601B	"
20.	Speaker	Altec	601B	"
21.	Speaker	Altec	601B	"
22.	Speaker	Altec	601B	"
23.	Horn	University	PA-30	"
24.	Horn	University	PA-30	"
25.	Horn	University	PA-30	"
26.	Horn	University	PA-30	"

* Western Electro-Acoustical Laboratory

8.0 DISPOSITION OF TEST SPECIMEN:

The AIG Pod was transferred to the High Intensity Noise Environmental Chamber at the General Dynamics Acoustic Laboratory Facility in order to undergo additional testing.

AIG POD ACOUSTIC TEST PROGRAM



TEST EQUIPMENT BLOCK DIAGRAM

FIGURE 1

PREPARED BY	DATE	CHECKED BY	DATE	REVISED BY	DATE

FORM 73 (REV 6-61)

FIGURE 2 - AIG POD ACOUSTIC TEST PROGRAM

Test No.	Pod Lining	Muffler Config.	Ant. Config.	Dlay On Intakes	Clay On Exhaust	Computer Cover "Tub"	Computer Cover Sides	Computer Cover Bottom	Bulkh'd	Inline Muffler	E B
1.1	2" F.G.	OP.	OP.	NO	NO	NO	NO	NO	NO	NO	
1.2	2" F.G.	OP.	R&D	NO	NO	NO	NO	NO	NO	NO	
2.0	2" F.G.	OP.	OP.	YES	YES	YES	YES	YES	NO.1	NO	
2.0.1	2" F.G.	OP.	OP.	YES	YES	YES	YES	YES	NO.1	NO	
2.1	2" F.G.	OP.	OP.	NO	YES	YES	YES	YES	NO.1	NO	
2.1.1	2" F.G.	OP.	OP.	NO	YES	YES	YES	YES	NO.1	NO.1	
2.2	2" F.G.	OP.	OP.	YES	NO	YES	YES	YES	NO.1	NO	
2.2.1(a)	2" F.G.	OP.	OP.	YES	NO	YES	YES	YES	NO.1	NO	
2.2.1(b)	2" F.G.	OP.	OP.	YES	NO	YES	YES	YES	NO.1	NO	
2.3	2" F.G.	OP.	OP.	YES	YES	YES	YES	YES	NO	NO	
2.4	2" F.G.	OP.	OP.	NO	YES	YES	YES	YES	NO	NO	
2.5	2" F.G.	OP.	OP.	YES	NO	YES	YES	YES	NO	NO	
2.6	2" F.G.	OP.	OP.	YES	YES	YES	YES	YES	NO.2	NO	
3.0	2" F.G.	OP.	OP.	YES	YES	YES	YES	YES	NO.1	NO	
3.0.1	2" F.G.	OP.	OP.	YES	YES	YES	YES	YES	NO.1	NO	
3.1	2" F.G.	OP.	OP.	NO	YES	YES	YES	YES	NO.1	NO	
3.1.1(a)	2" F.G.	OP.	OP.	NO	YES	YES	YES	YES	NO.1	NO.1	
3.1.1(b)	2" F.G.	OP.	OP.	NO	YES	YES	YES	YES	NO.1	NO.2	
3.2	2" F.G.	OP.	OP.	YES	NO	YES	YES	YES	NO.1	NO	
3.2.1(a)	2" F.G.	OP.	OP.	YES	NO	YES	YES	YES	NO.1	NO	
3.2.1(b)	2" F.G.	OP.	OP.	YES	NO	YES	YES	YES	NO.1	NO	
3.3	2" F.G.	OP.	OP.	YES	YES	YES	YES	YES	NO	NO	
3.4	2" F.G.	OP.	OP.	NO	YES	YES	YES	YES	NO	NO	
3.5	2" F.G.	OP.	OP.	YES	NO	YES	YES	YES	NO	NO	
3.5.1	2" F.G.	OP.	OP.	YES	YES	YES	YES	YES	NO.2	NO	
3.5.2	2" F.G.	OP.	OP.	YES	YES	YES	YES	NO	NO.1	NO	
3.6(a)	2" F.G.	OP.	OP.	YES	YES	NO	NO	NO	NO	NO	
3.6(b)	2" F.G.	OP.	OP.	NO	NO	NO	NO	NO	NO	NO	
3.6.1(a)	2" F.G.	OP.	OP.	YES	YES	NO	NO	NO	NO	NO	
3.6.1(b)	2" F.G.	OP.	OP.	NO	NO	NO	NO	NO	NO	NO	
3.6.2	2" F.G.	OP.	OP.	NO	NO	NO	NO	NO	NO	NO	
3.7(a)	2" F.G.	OP.	R&D	YES	YES	NO	NO	NO	NO	NO	
3.7(b)	2" F.G.	OP.	R&D	NO	NO	NO	NO	NO	NO	NO	
3.7.1	2" F.G.	OP.	OP.	YES	YES	YES	NO	NO	NO.	NO	
3.7.2	2" F.G.	OP.	OP.	YES	YES	YES	NO	NO	NO.	NO	
3.7.3	2" F.G.	OP.	OP.	YES	YES	YES	NO	NO	NO.	NO	
3.7.4	2" F.G.	OP.	OP.	NO	NO	YES	YES	NO	NO.	NO.	
3.7.4.1	2" F.G.	OP.	OP.	NO	NO	YES	YES	NO	NO.	NO.2	
3.7.4.2	2" F.G.	OP.	OP.	NO	NO	YES	YES	NO	NO.	NO.	

'd	Inline Muffler	Exhaust Baffle	Door Bulkh'd	Comp. Config.	CPS	CPS 75-150 N.R.(db)	CPS 150-300 N.R.(db)	CPS 300-600 N.R.(db)	CPS 600-1200 N.R.(db)	CPS 1200-2400 N.R.(db)	CPS 2400-4800 N.R.(db)	CPS 4800-10K N.R.(db)
	NO	NO	NO	OP.		14.0	18.0	19.5	33.0	41.0	47.0	53.5
	NO	NO	NO	OP.		18.0	17.5	14.5	33.5	41.0	46.0	54.5
1	NO	NO	NO.1	OP.		18.0	19.5	31.5	43.5	50.5	56.5	67.0
1	NO	NO	NO.1	OP.		16.0	17.0	25.5	42.5	49.0	56.0	63.5
1	NO	NO	NO.1	OP.		15.0	21.0	27.5	41.5	45.5	56.0	66.5
1	NO.1	NO	NO.1	OP.		16.0	19.0	26.5	42.5	49.0	57.5	70.0
1	NO	NO	NO.1	OP.		16.0	18.0	26.5	43.5	50.0	56.0	66.5
1	NO	NO.1	NO.1	OP.		18.0	18.0	23.5	42.5	47.0	55.0	67.0
1	NO	NO.2	NO.1	OP.		18.0	18.0	24.5	43.5	47.5	57.0	67.0
	NO	NO	NO.1	OP.		19.0	18.0	24.5	43.5	49.0	55.5	67.0
	NO	NO	NO.1	OP.		20.0	19.0	24.5	40.5	46.0	58.0	65.5
	NO	NO	NO.1	OP.		20.0	18.0	23.5	43.0	45.0	55.5	65.5
2	NO	NO	NO.1			19.5	19.5	31.5	43.5	50.0	57.0	67.0
1	NO	NO	NO.1	OP.		19.5	20.5	31.0	41.5	49.0	55.5	66.0
1	NO	NO	NO.1	OP.		19.5	18.5	28.0	36.0	45.0	49.0	58.0
1	NO	NO	NO.1	OP.		20.0	20.0	28.0	39.0	46.0	55.5	66.0
1	NO.1	NO	NO.1	OP.		19.0	19.0	27.5	42.0	48.5	56.0	65.5
1	NO.2	NO	NO.1	OP.		19.5	18.5	29.5	41.5	49.5	56.0	66.5
1	NO	NO	NO.1	OP.		20.0	19.0	29.5	42.0	49.5	55.0	65.0
1	NO	NO.1	NO.1	OP.		18.5	20.5	29.5	42.0	49.0	56.0	66.5
1	NO	NO.2	NO.1	OP.		19.0	19.5	30.5	42.0	49.5	56.0	66.5
	NO	NO	NO.1	OP.		18.5	19.5	30.0	37.0	46.0	51.5	61.5
	NO	NO	NO.1	OP.		19.5	20.0	28.5	36.5	44.0	52.5	62.0
	NO	NO	NO.1	OP.		18.5	19.0	28.5	37.0	44.5	51.0	59.0
	NO	NO	NO.1	OP.		21.5	20.0	30.0	41.5	48.0	56.0	65.5
	NO	NO	NO.1	OP.		17.5	21.5	31.0	40.0	49.0	55.0	66.5
	NO	NO	NO	OP.		14.5	14.0	19.5	30.0	39.0	42.0	49.5
	NO	NO	NO	OP.		16.5	14.5	20.5	29.5	37.5	41.0	46.5
	NO	NO	NO	OP.		14.0	16.5	19.5	28.5	34.5	39.5	47.5
	NO	NO	NO	OP.		16.5	14.5	18.5	28.5	36.0	37.0	44.5
	NO	NO	NO	TAPED		18.5	14.5	20.0	32.0	38.0	42.0	48.5
	NO	NO	NO	OP.		12.5	19.0	21.0	30.5	39.5	41.0	50.0
	NO	NO	NO	OP.		17.5	16.0	20.5	30.0	40.0	42.5	49.5
	NO	NO	NO.1	OP.		14.0	18.5	20.5	32.5	40.0	43.0	54.0
	NO	NO	NO.1	OP.		18.0	20.0	23.5	36.5	44.5	48.5	59.5
	NO	NO	NO.1	OP.		19.5	20.5	24.0	36.0	44.5	49.5	59.5
	NO.2	NO	NO.1	OP.		20.0	18.5	25.0	39.5	47.5	53.5	63.0
	NO.2	NO	NO	OP.		20.5	17.5	25.5	40.0	47.5	54.0	63.5
2	NO.2	NO	NO	OP.		21.0	18.5	26.0	39.5	47.5	54.0	63.5

B.

FORM 73 (REV. 6-61)

FIGURE 2 - AIG POD ACOUSTIC TEST PROGRAM

Test No.	Pod Lining	Muffler Config.	Ant. Config.	Clay On Intakes	Clay On Exhaust	Computer Cover "Tub"	Computer Cover Sides	Computer Cover Bottom	Bulkh'd	Inline Muffler	Exhau Baffl
3.7.5	2" F.G.	OP.	OP.	NO	NO	YES	YES	NO	NO.3	NO.2	NO
3.7.6	2" F.G.	OP.	OP.	NO	NO	NO	NO	NO	NO.3	NO	NO
3.7.6.1	2" F.G.	OP.	OP.	NO	NO	NO	NO	NO	NO.3	NO	NO
3.7.6.2	2" F.G.	OP.	OP.	NO	NO	NO	NO	NO	NO.3	NO	NO
3.8	2" F.G.	OP.	OP.	NO	NO	YES	YES	NO	NO.3	NO	NO
3.8.1	2" F.G.	OP.	OP.	NO	NO	YES	YES	NO	NO.3	NO	NO
3.8.2	2" F.G.	OP.	R&D	NO	NO	YES	YES	NO	NO.3	NO	NO
3.9	2" F.G.	OP.	OP.	NO	NO	NO	NO	NO	NO	NO	NO
3.9.1	2" F.G.	OP.	OP.	NO	NO	NO	NO	NO	NO	NO	NO
3.9.2	2" F.G.	OP.	OP.	NO	NO	NO	NO	NO	NO.3	NO	NO
4.0	2" FOAM	OP.	OP.	NO	NO	NO	NO	NO	NO	NO	NO
4.1	2" FOAM	OP.	OP.	NO	NO	NO	NO	NO	NO.3	NO	NO
4.2	2" FOAM	OP.	OP.	NO	NO	YES	NO	NO	NO.3	NO.2	NO
4.3	2" FOAM	OP.	OP.	NO	NO	YES	NO	NO	NO.3	NO.2	NO
4.4	2" FOAM	OP.	OP.	NO	NO	YES	YES	NO	NO.3	NO.2	NO
4.5	2" FOAM	OP.	OP.	NO	NO	YES	YES	NO	NO.3	NO.2	NO
4.6	2" FOAM	OP.	OP.	NO	NO	YES	YES	NO	NO.3	NO	NO
4.7	2" FOAM	OP.	OP.	NO	NO	YES	YES	NO	NO.3	NO	NO
4.8	2" FOAM	OP.	OP.	NO	NO	YES	YES	NO	NO.3	NO	NO
4.9	2" FOAM	OP.	OP.	NO	NO	YES	YES	NO	NO.3	NO	NO
4.9.1	2" FOAM	NO.1	OP.	NO	NO	YES	YES	NO	NO.3	NO	NO
4.9.2	2" FOAM	NO.2	OP.	NO	NO	YES	YES	NO	NO.3	NO	NO
5.0	2" FOAM	OP.	OP.	NO	NO	NO	NO	NO	NO	NO	NO
5.1	2" FOAM	OP.	OP.	NO	NO	NO	NO	NO	NO.3	NO	NO
5.2	2" FOAM	OP.	OP.	NO	NO	NO	YES	NO	NO.3	NO	NO
5.3	2" FOAM	OP.	OP.	NO	NO	YES	YES	NO	NO.3	NO	NO
5.4	2" FOAM	OP.	OP.	NO	NO	NO	YES	NO	NO.3	NO	NO
6.0	2" FOAM	TAPED	OP.	NO	NO	YES	YES	NO	NO.	NO	NO
6.1	2" FOAM	OP.	OP.	NO	NO	YES	YES	NO	NO.	NO	NO

See NOTES associated with Figure 2 on the following page.

UNCLASSIFIED

A.

'd	Inline Muffler	Exhaust Baffle	Door Bulkh'd	Comp. Config.		CPS 75-150 N.R.(db)	CPS 150-300 N.R.(db)	CPS 300-600 N.R.(db)	CPS 600-1200 N.R.(db)	CPS 1200-2400 N.R.(db)	CPS 2400-4800 N.R.(db)	CPS 4800-10K N.R.(db)
	NO.2	NO	NO.1	OP.		20.0	18.5	25.5	39.5	48.0	54.0	64.0
	NO	NO	NO	OP.		16.5	12.5	20.0	30.5	39.5	42.0	48.0
	NO	NO	NO.2	OP.		16.0	15.5	20.5	31.0	40.0	43.0	51.5
	NO	NO	NO.2	OP.		17.0	17.0	21.0	31.5	40.5	43.5	51.5
	NO	NO	NO.2	OP.		22.0	18.0	24.5	38.5	46.5	55.5	65.0
	NO	NO	NO.2	TAPED		21.0	19.5	27.5	37.5	48.0	54.0	66.0
	NO	NO	NO.2	TAPED		19.5	19.0	26.5	37.5	46.0	54.5	67.0
	NO	NO	NO	OP.		18.0	14.0	16.5	31.0	37.5	42.5	51.0
	NO	NO	NO	OP.		19.5	14.0	15.0	30.0	39.5	46.5	51.0
	NO	NO	NO.2	OP.		19.5	15.0	16.5	31.0	39.0	45.0	53.0
	NO	NO	NO	OP.		14.0	13.0	20.5	30.0	37.0	41.5	48.5
	NO	NO	NO.2	OP.		15.0	16.0	21.5	32.0	39.0	47.0	57.5
	NO.2	NO	NO	OP.		20.5	16.5	26.0	40.0	45.5	54.5	64.5
	NO.2	NO	NO.2	OP.		19.5	17.5	26.0	40.0	46.0	54.5	65.5
	NO.2	NO	NO.2	OP.		20.0	18.5	27.0	40.5	46.5	56.0	65.0
	NO.2	NO	NO.2	OP.		19.0	19.5	27.5	41.0	49.0	57.0	66.5
	NO	NO	NO.2	OP.		19.0	18.5	26.5	39.5	46.5	55.5	66.0
	NO	NO	NO.2	OP.		19.0	20.0	26.5	39.5	46.5	56.5	65.0
	NO	NO	NO.2	OP.		20.0	19.0	26.5	42.5	49.0	56.5	66.5
	NO	NO	NO.2	OP.		19.5	19.5	26.5	42.5	49.5	56.5	66.5
	NO	NO	NO.2	OP.		20.0	18.5	26.5	40.5	48.0	56.5	65.5
	NO	NO	NO.2	OP.		19.0	17.0	25.5	40.0	49.5	55.0	65.5
	NO	NO	NO	TAR		17.0	18.0	18.5	33.0	41.0	49.5	55.5
	NO	NO	NO.2	TAR		20.0	21.0	18.5	33.0	40.5	50.0	58.5
	NO	NO	NO.2	TAR		19.5	21.5	19.0	37.2	42.5	52.5	63.5
	NO	NO	NO.2	TAR		21.5	25.0	26.0	40.5	48.0	61.0	68.0
	NO	NO	NO.2	TAR		16.0	22.0	19.5	37.5	45.0	55.5	69.0
	NO	NO	NO.2	OP.		20.5	17.0	28.0	39.0	47.0	56.0	66.0
	NO	NO	NO.2	TAPED		18.0	19.0	27.0	38.5	49.0	59.0	68.0

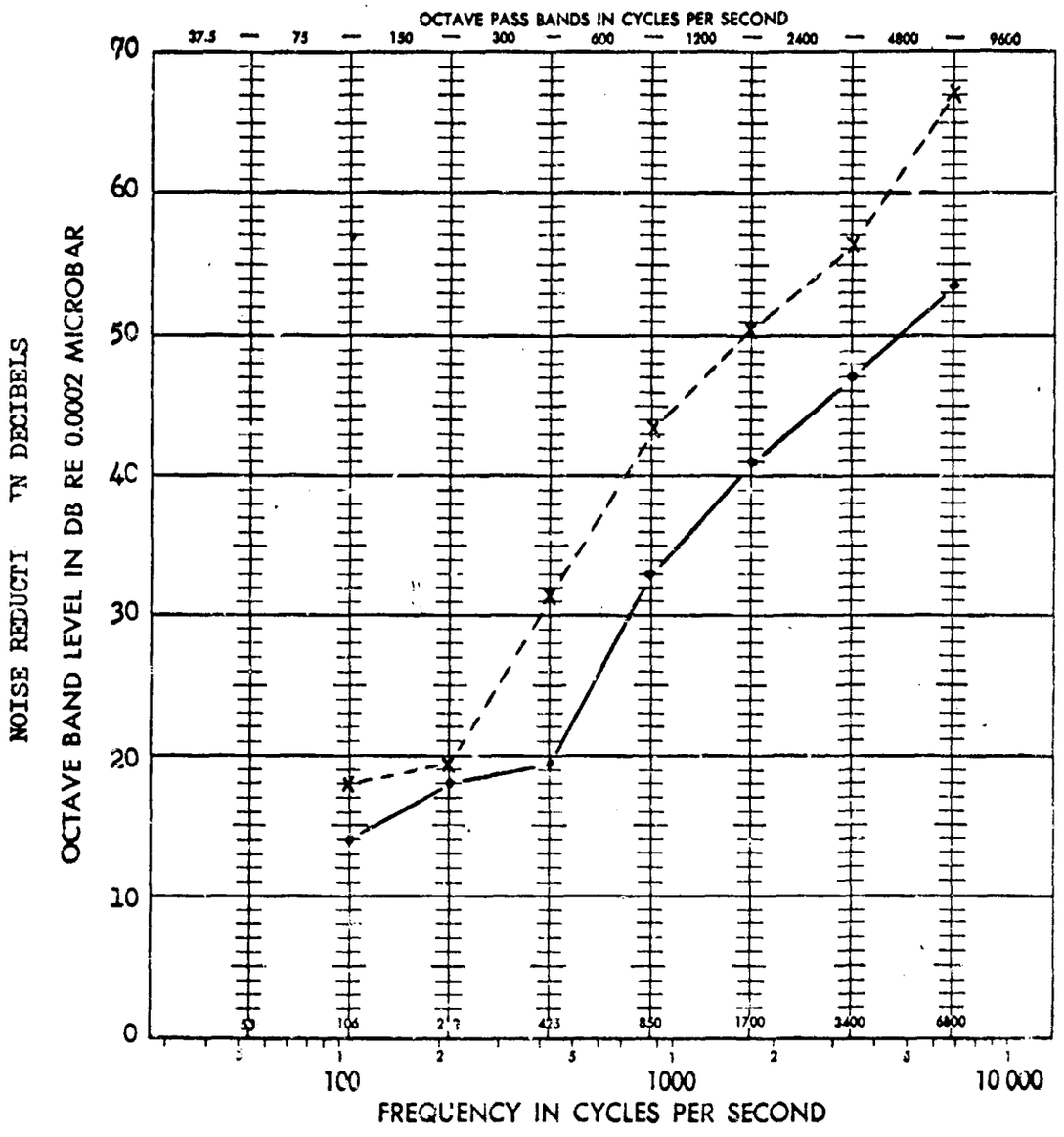
B.

FIGURE 8

NOTES:

1. Tests 1.1 through 2.6 were run with full pod lining, the rese were with the forward section lined only.
2. All tests run with the R & D antenna, except test 3.8.2, also included the ASC and DSC.
3. The aft section of the "tub" was not on for tests 2.0.1 and 3.0.1.
4. On tests 3.6.1(a) and 3.6.1(b) the F.G. was removed over and around antenna area.
5. Only aft section of the "tub" was used during test 3.7.1.
6. On tests 3.7.4 and 3.7.5 only the front side of the computer cover was used.
7. An additional 1" of foam was placed in the ASC, DSC area for tests 3.8, 3.8.1, 3.8.2, 4.5, 4.6, 4.7, 4.8, 4.9, 4.9.1, 4.9.2, 5.0, 5.1, 5.2, 5.3, 5.4, 6.0 and 6.1.
8. AIG Pod was wrapped with a foam blanket for test 3.9.
9. AIG Pod was wrapped with a foam blanket including ends for tests 3.9.11 and 5.4.
10. Added foam in open areas around bulkhead for tests 4.7, 4.8 and 4.9.
11. On tests 4.8 and 4.9 air duct was removed and end clayed.
12. Test 4.9 had foam in vert. sight tube with door clayed.

AIG POD ACOUSTIC TEST PROGRAM



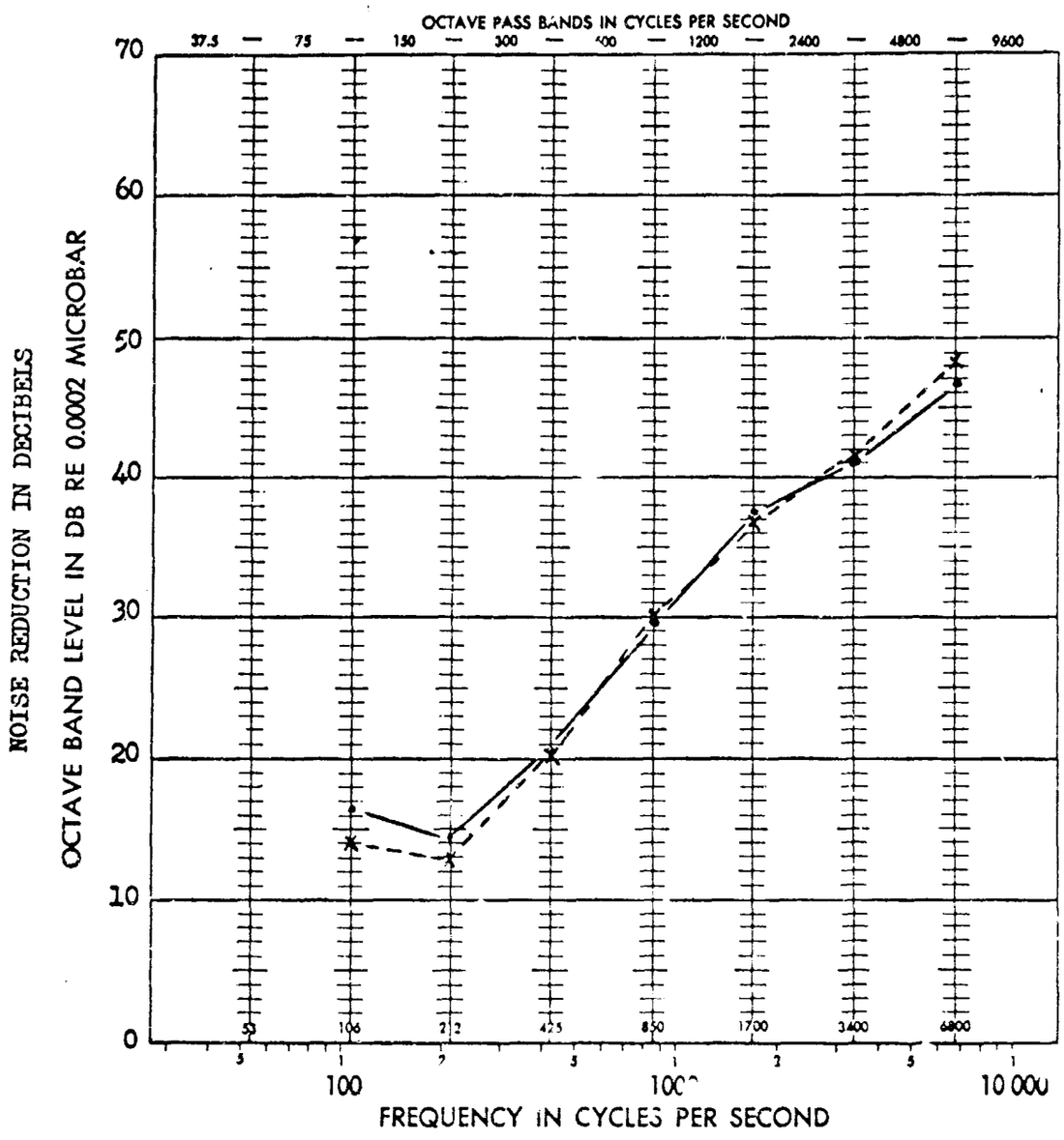
LEGEND:

. _____ Baseline - Ref. Test 1.1
x_ _ _ _ Computer Enclosure - Ref. Test 2.0

BASELINE VS. COMPUTER ENCLOSURE

FIGURE 3

AIG POD ACOUSTIC TEST PROGRAM



LEGEND:

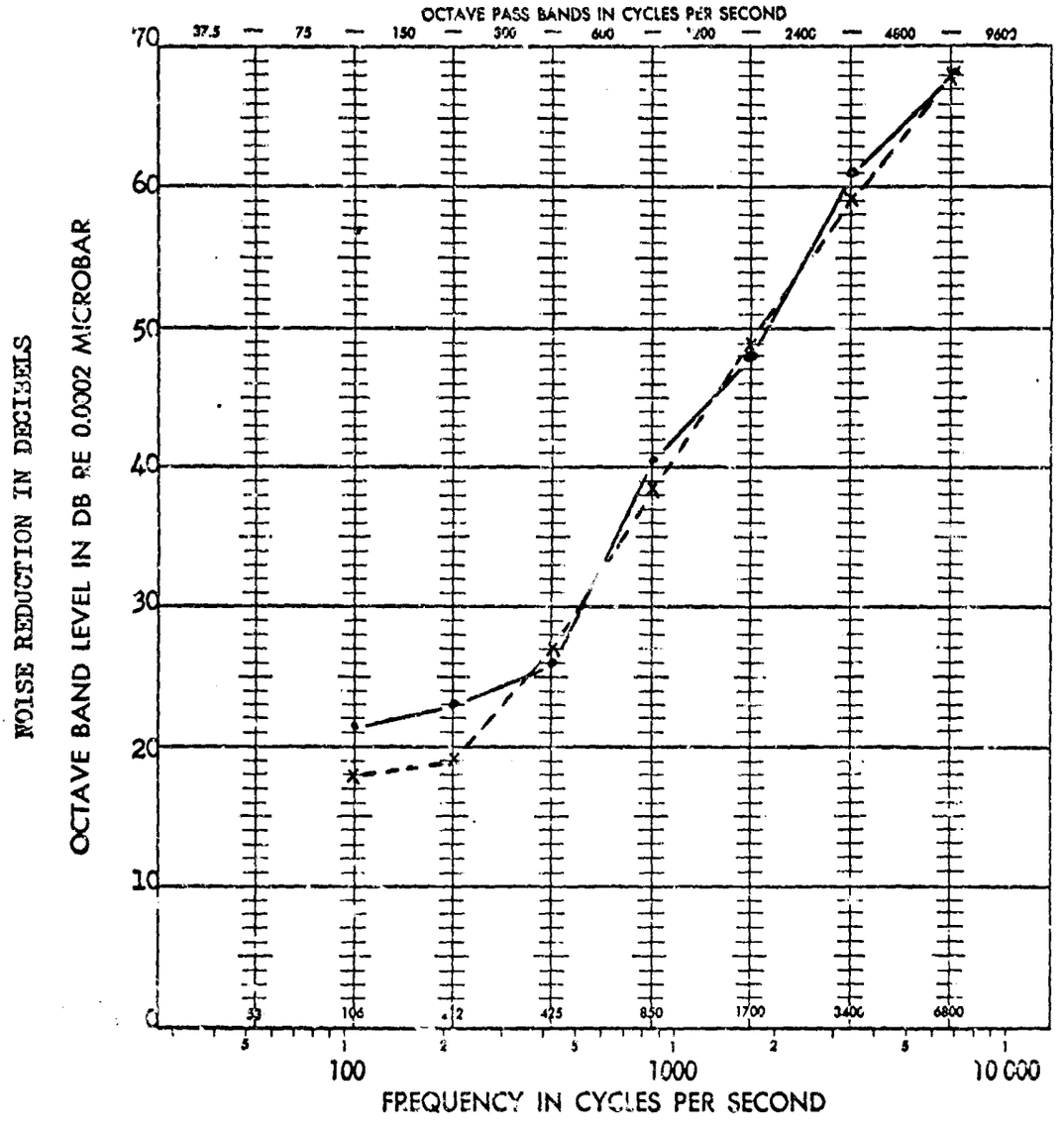
._____ Fiberglass - Ref. Test 3.6b
x_ _ _ _ Foam - Ref. Test 4.0

FIBERGLASS VS. FOAM

FIGURE 4

~~UNCLASSIFIED~~
~~CONFIDENTIAL~~

AIC POD ACOUSTIC TEST PROGRAM



LEGEND:

•_____ Tarred Computer - Ref. Test 5.3
x _ _ _ _ Taped Computer - Ref. Test 5.1

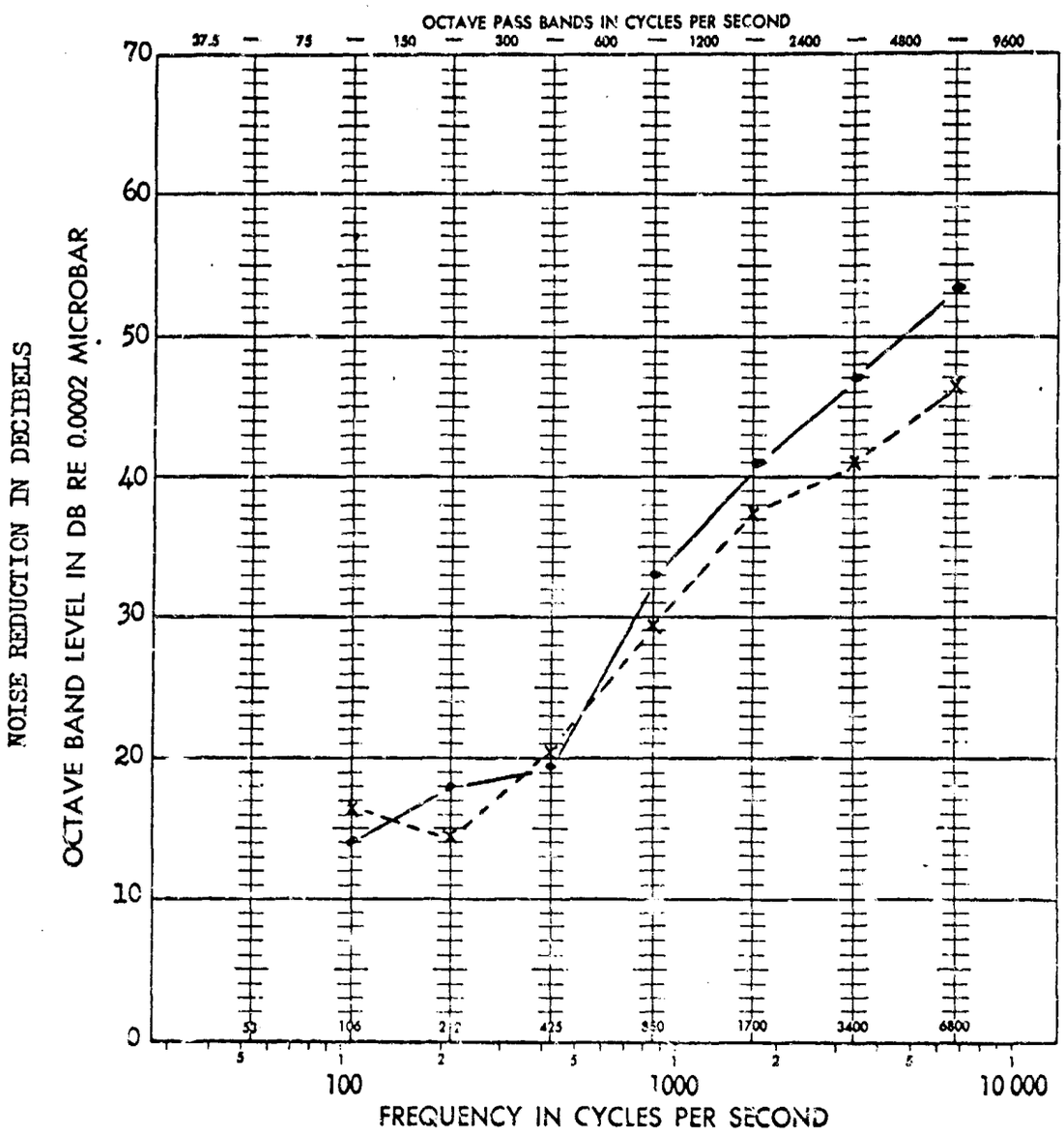
TARRED COMPUTER VS. TAPED COMPUTER

FIGURE 5

UNCLASSIFIED

~~CONFIDENTIAL~~

AIC POD ACOUSTIC TEST PROGRAM



LEGEND:

._____ Full Pod Lining - Ref. Test 1.1
x_ _ _ _ Half Pod Lining - Ref. Test 3.5b

FULL POD LINING VS. HALF POD LINING

FIGURE 6

AIG POD ACOUSTIC TEST PROGRAM

INTERIOR VIEW OF POD WITH FIBERGLASS LINING, LOOKING AFT

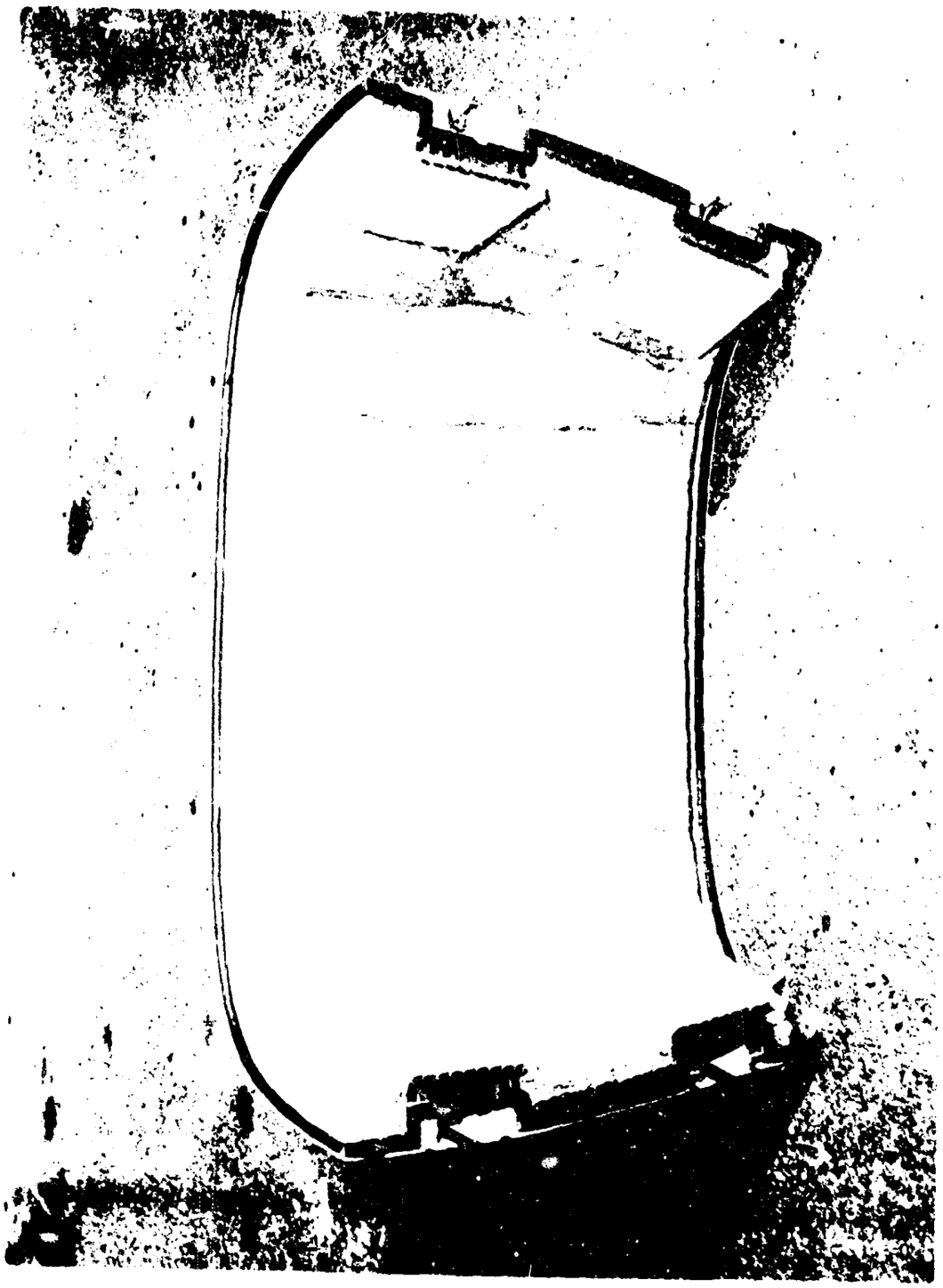
PHOTO NO. 1

AIG POD ACOUSTIC TEST PROGRAM

INTERIOR VIEW OF POD WITH FIBERGLASS LINING, LOOKING FORWARD

PHOTO NO. 2

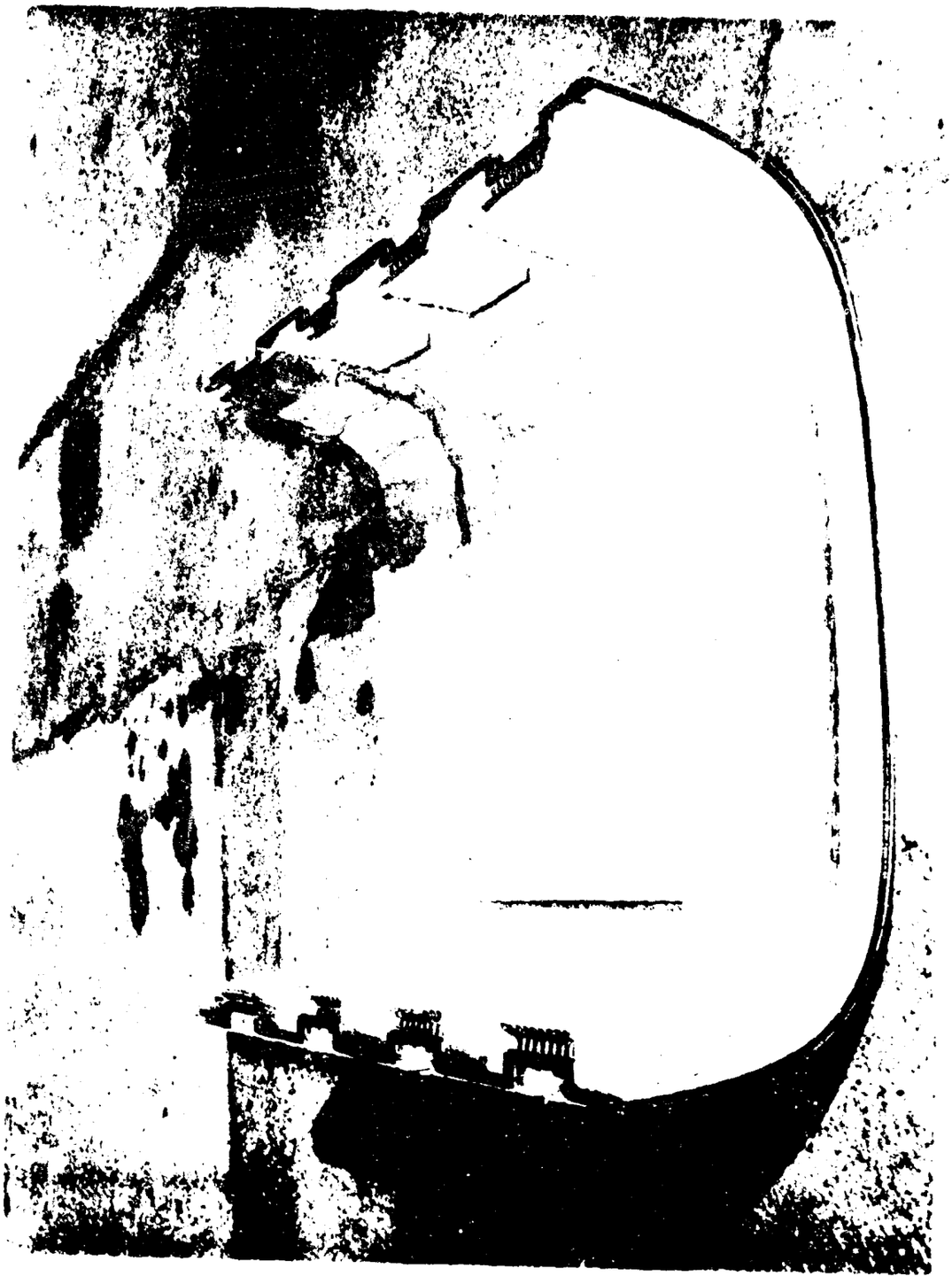
AIG POD ACOUSTIC TEST PROGRAM



AFT POD DOOR LINING WITH FIBERGLASS

PHOTO NO. 3

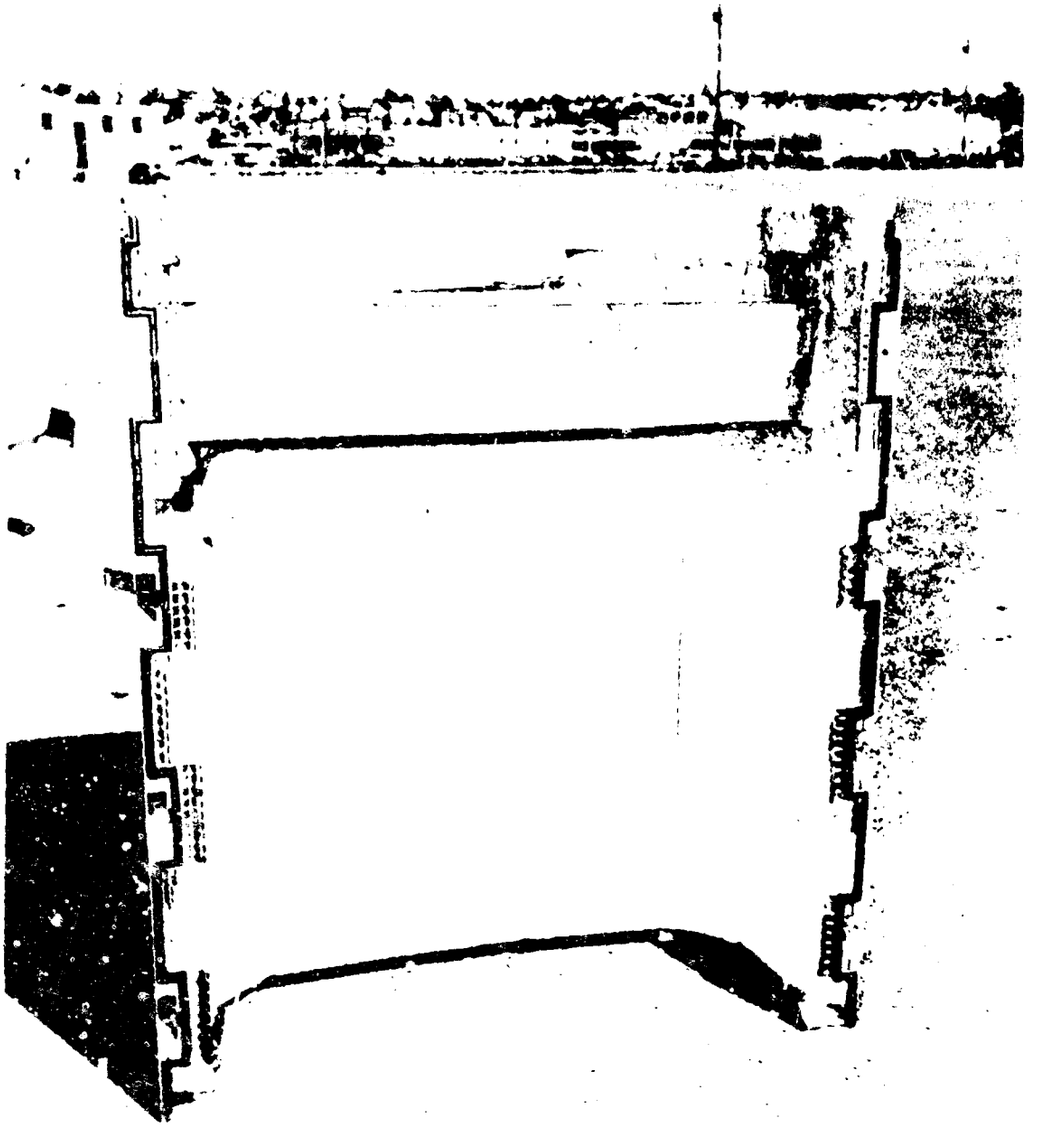
AIG POD ACOUSTIC TEST PROGRAM



FORWARD POD DOOR LINING WITH FIBERGLASS

PHOTO NO. 4

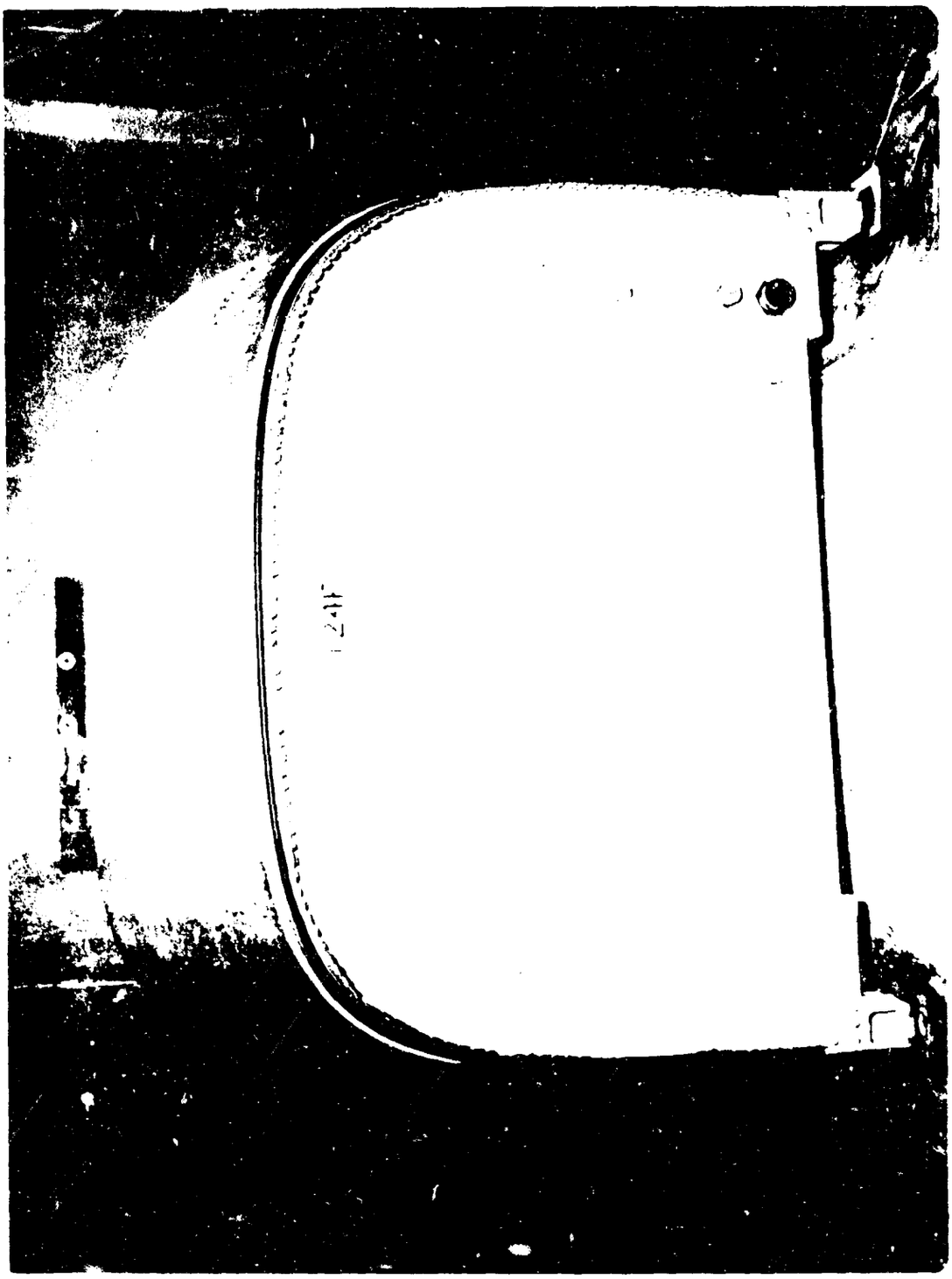
AIG POD ACOUSTIC TEST PROGRAM



FORWARD POD DOOR LINING WITH FIBERGLASS, R & D ANTENNA INSTALLED

PHOTO NO.

AIG POD ACOUSTIC TEST PROGRAM

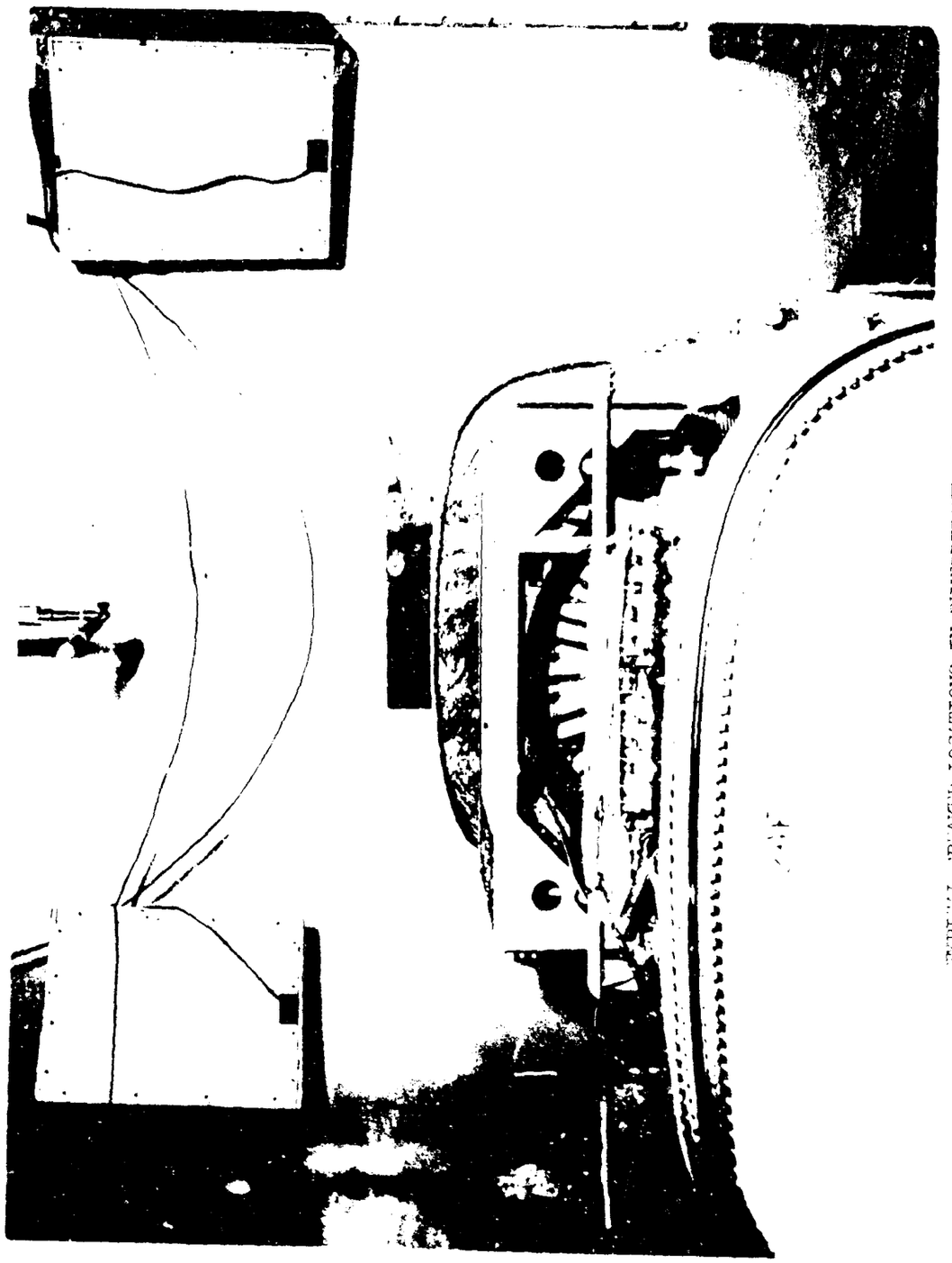


AIG POD ACOUSTIC TEST PROGRAM

SIDE VIEW OF AIG POD MOUNTED ON TEST FIXTURE

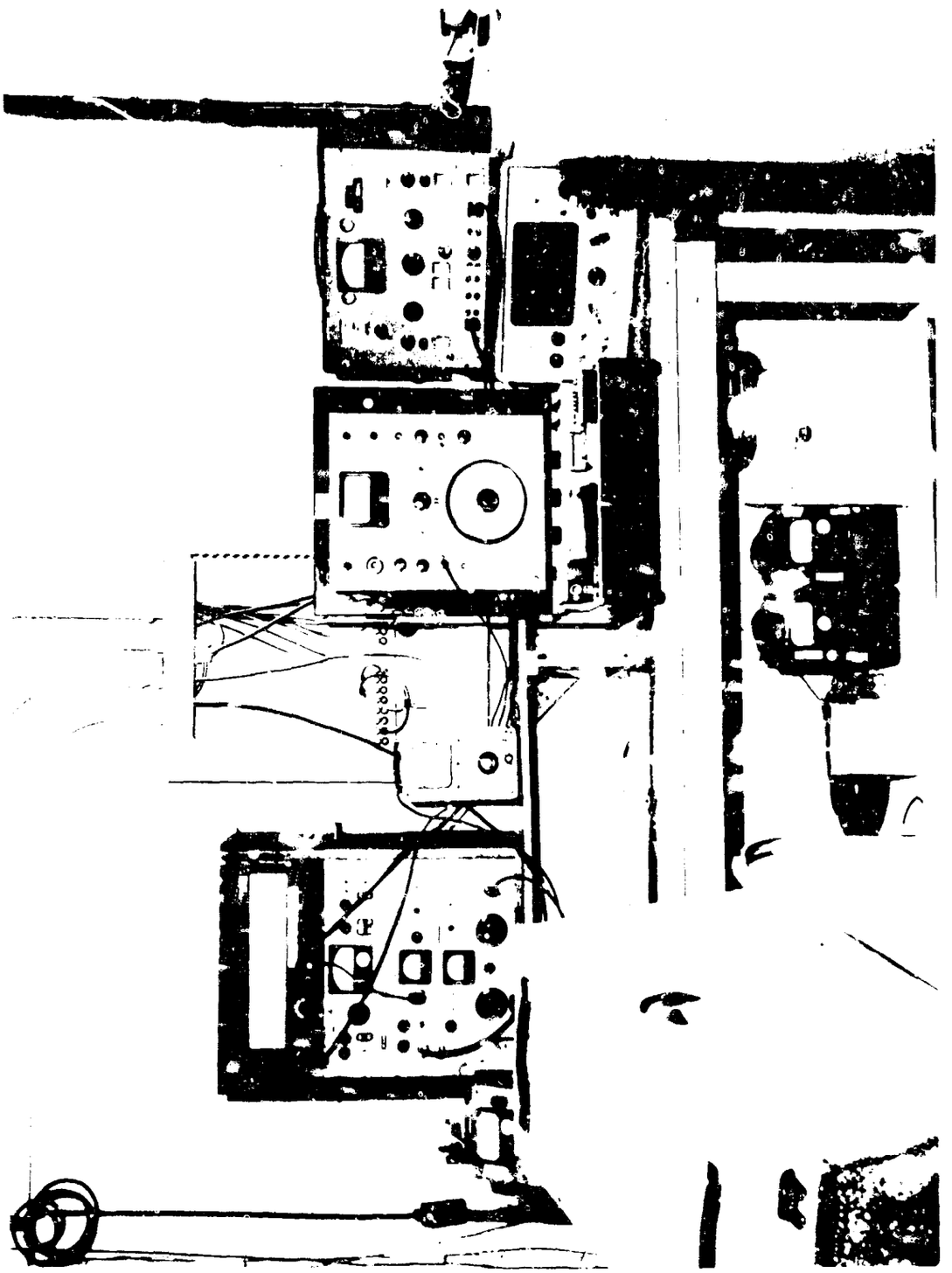
PHOTO NO. 7

AIG POD ACOUSTIC TEST PROGRAM



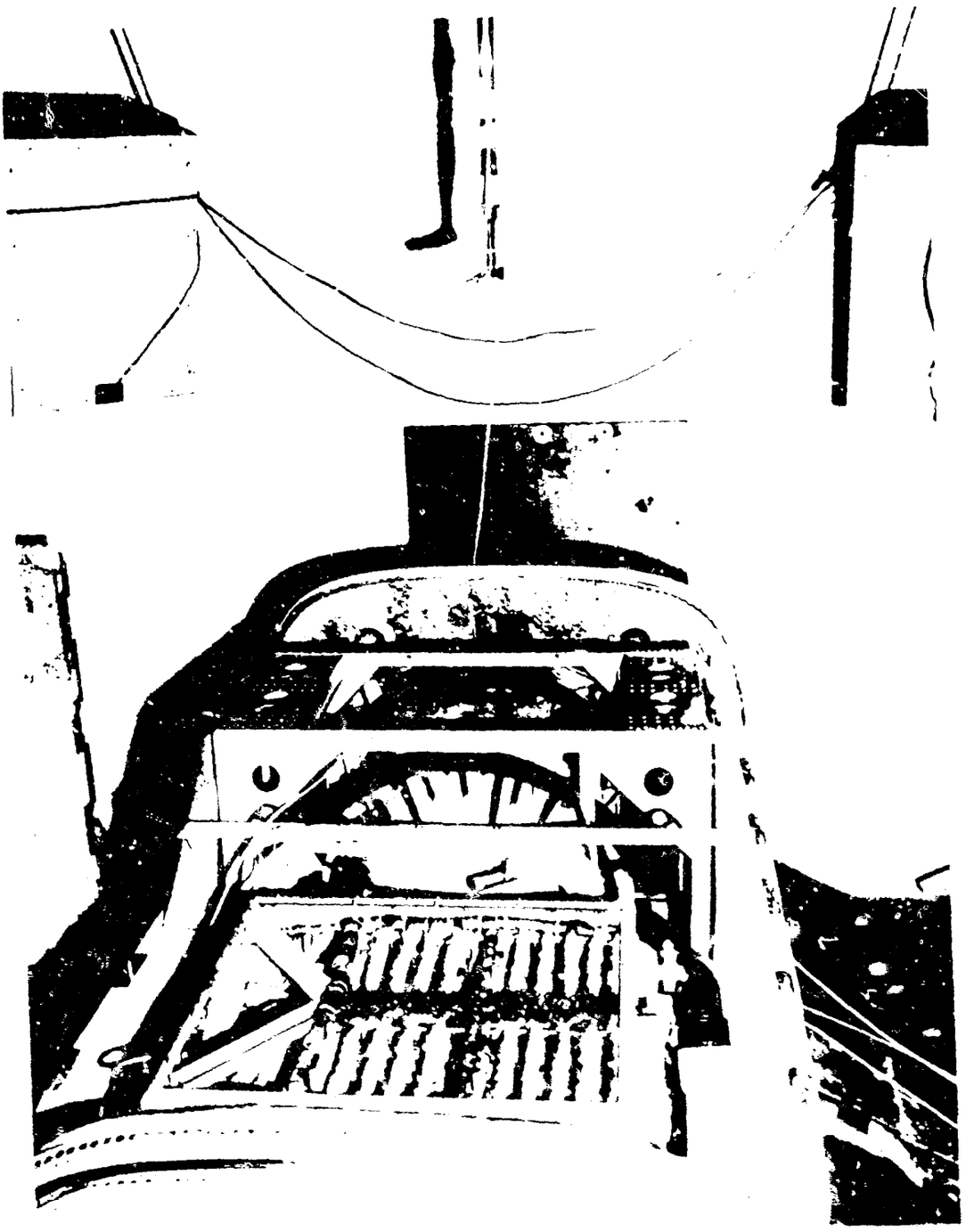
TYPICAL SPEAKER LOCATIONS IN REVERBERANT CHAMBER

AIG POD ACOUSTIC TEST PROGRAM



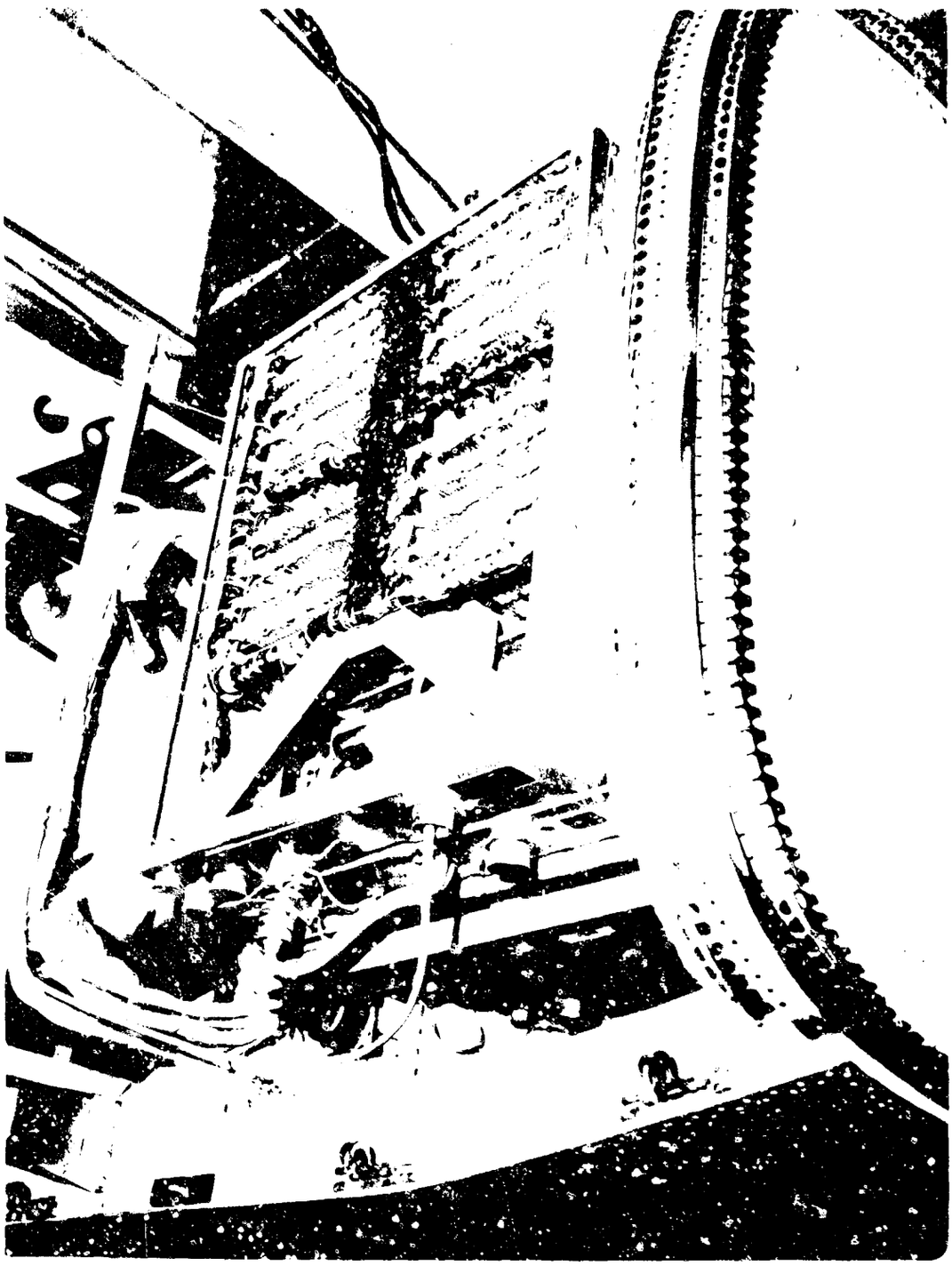
INSTRUMENTATION SETUP FOR OBTAINING [illegible] DATA

AIG POD ACOUSTIC TEST PROGRAM



TYPICAL MICROPHONE INSTALLATION [illegible]

AIG POD ACOUSTIC TEST PROGRAM



COMPUTER MICROPHONE MOUNTING AND LOCATION

PHOTO NO. 11

AIG POD ACOUSTIC TEST PROGRAM

INTERIOR VIEW OF POD WITH FOAM LINING, LOOKING AFT

PHOTO NO. 12

AIG POD ACOUSTIC TEST PROGRAM

INTERIOR VIEW OF POD WITH FOAM LINING, LOOKING FORWARD

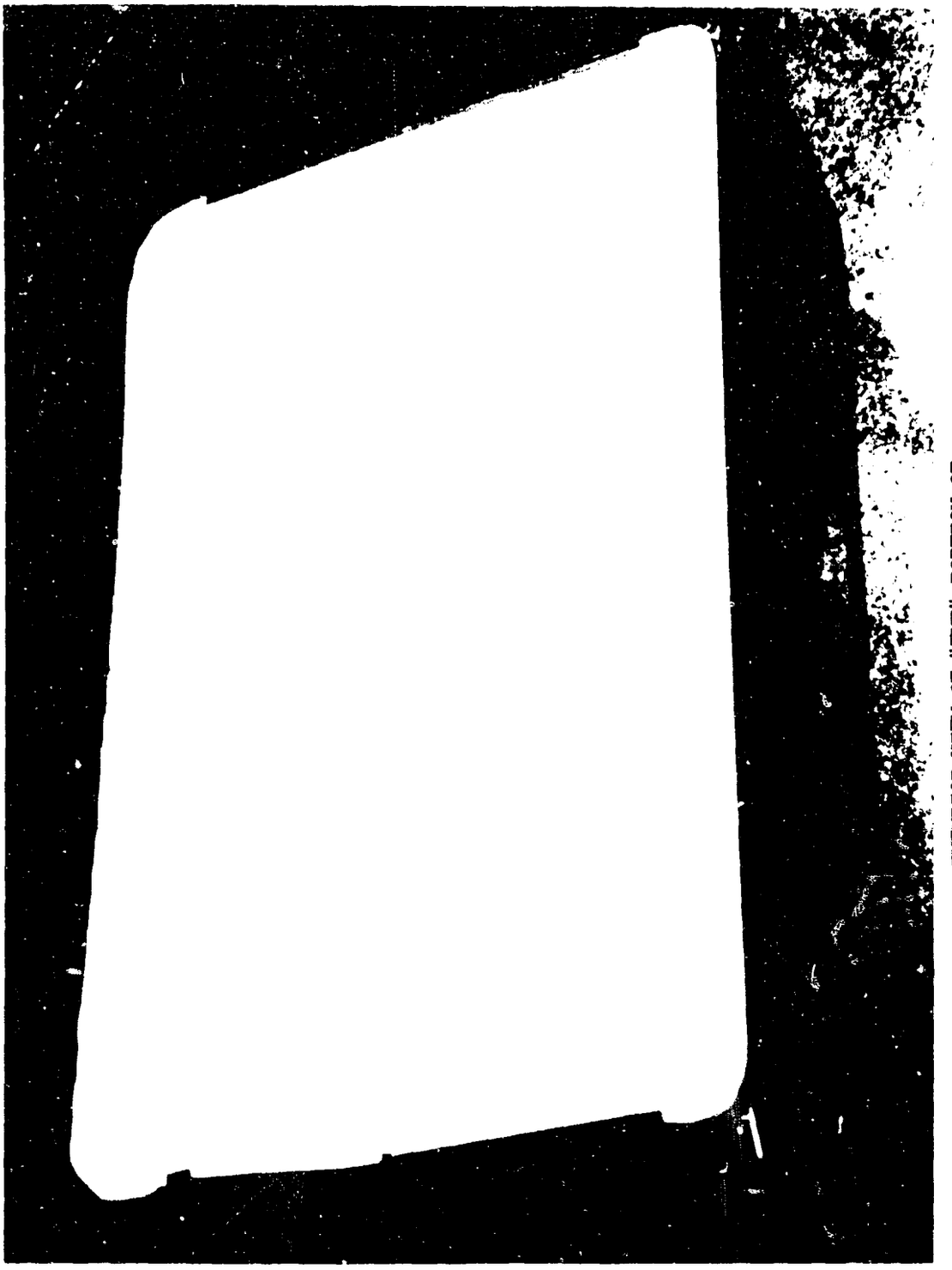
PHOTO NO. 13

AIG POD ACOUSTIC TEST PROGRAM

AFT POD DOOR LINING WITH FOAM

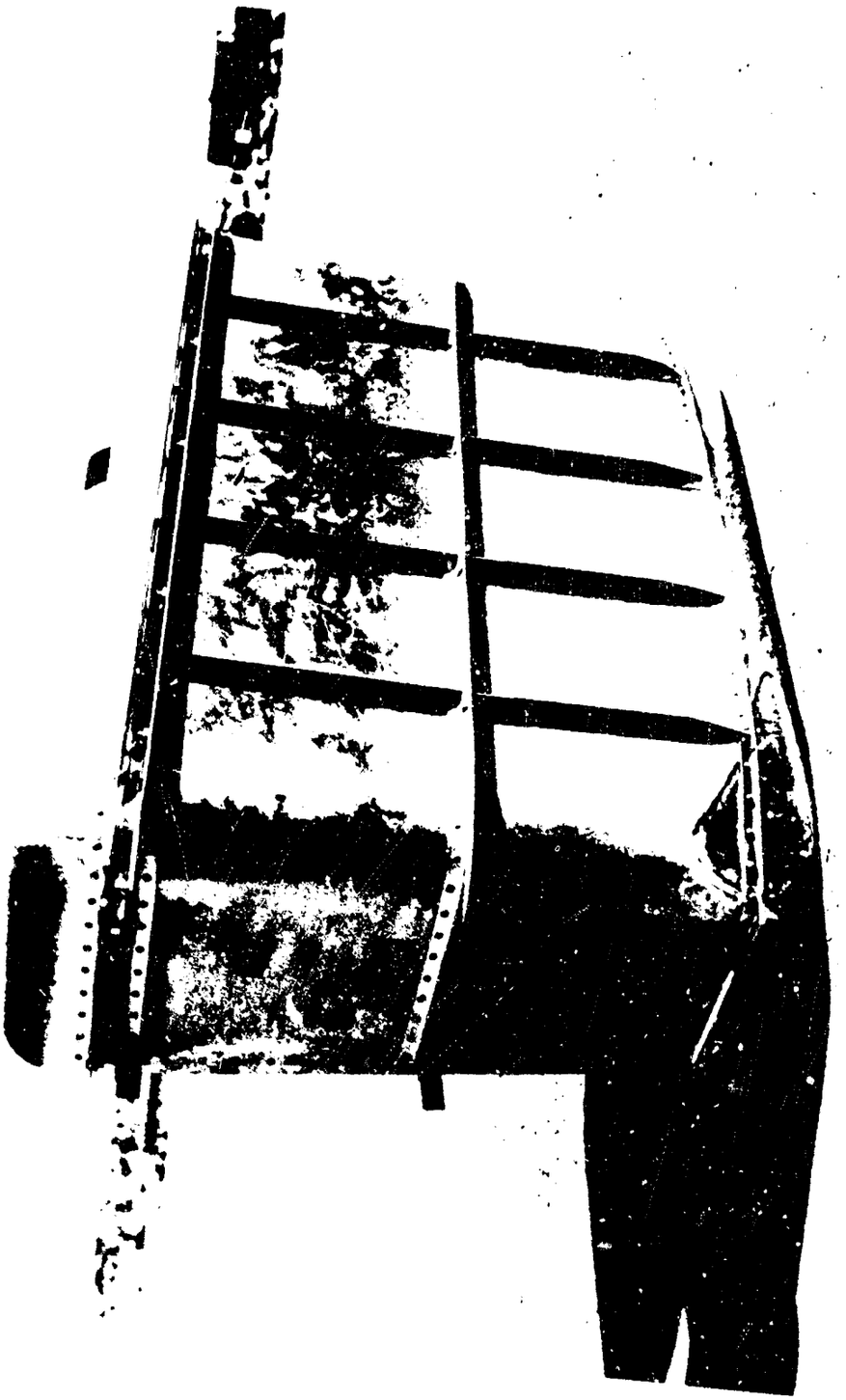
PHOTO NO. 14

AIG POD ACOUSTIC TEST PROGRAM



INTERIOR VIEW OF "TUB" PORTION OF COMPUTER ENCLOSURE

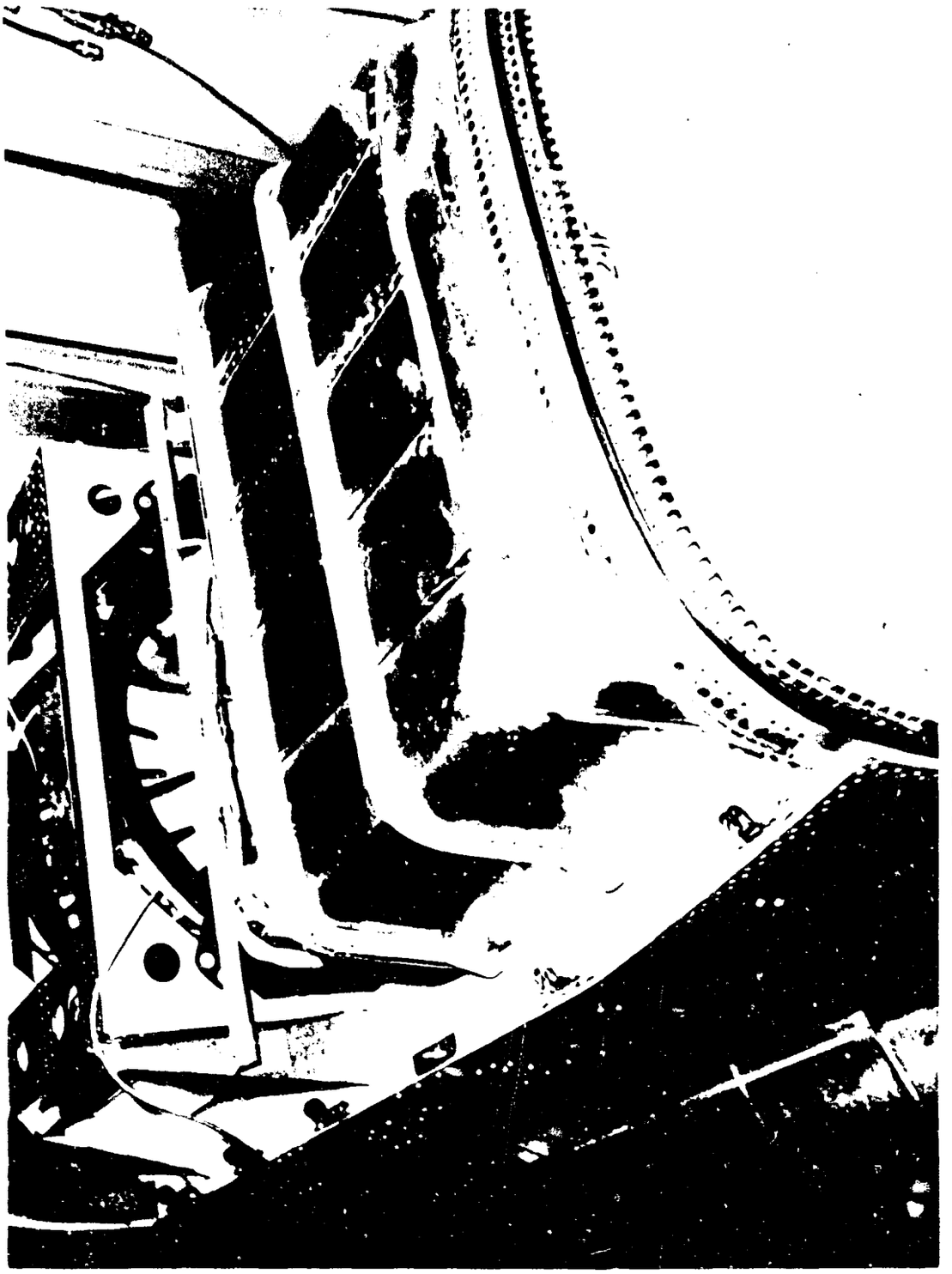
PHOTO NO. 15



EXTERIOR VIEW OF "TUF" PORTION OF COMPUTER ENCLOSURE

PHOTO NO. 16

AIG POD ACOUSTIC TEST PROGRAM



VIEW OF "TUB" POSITIONED IN AIG POD

PHOTO NO. 17

AIG POD ACOUSTIC TEST PROGRAM

COMPUTER ENCLOSURE INSTALLED IN AIG POD

PHOTO NO. 14

AIG POD ACOUSTIC TEST PROGRAM

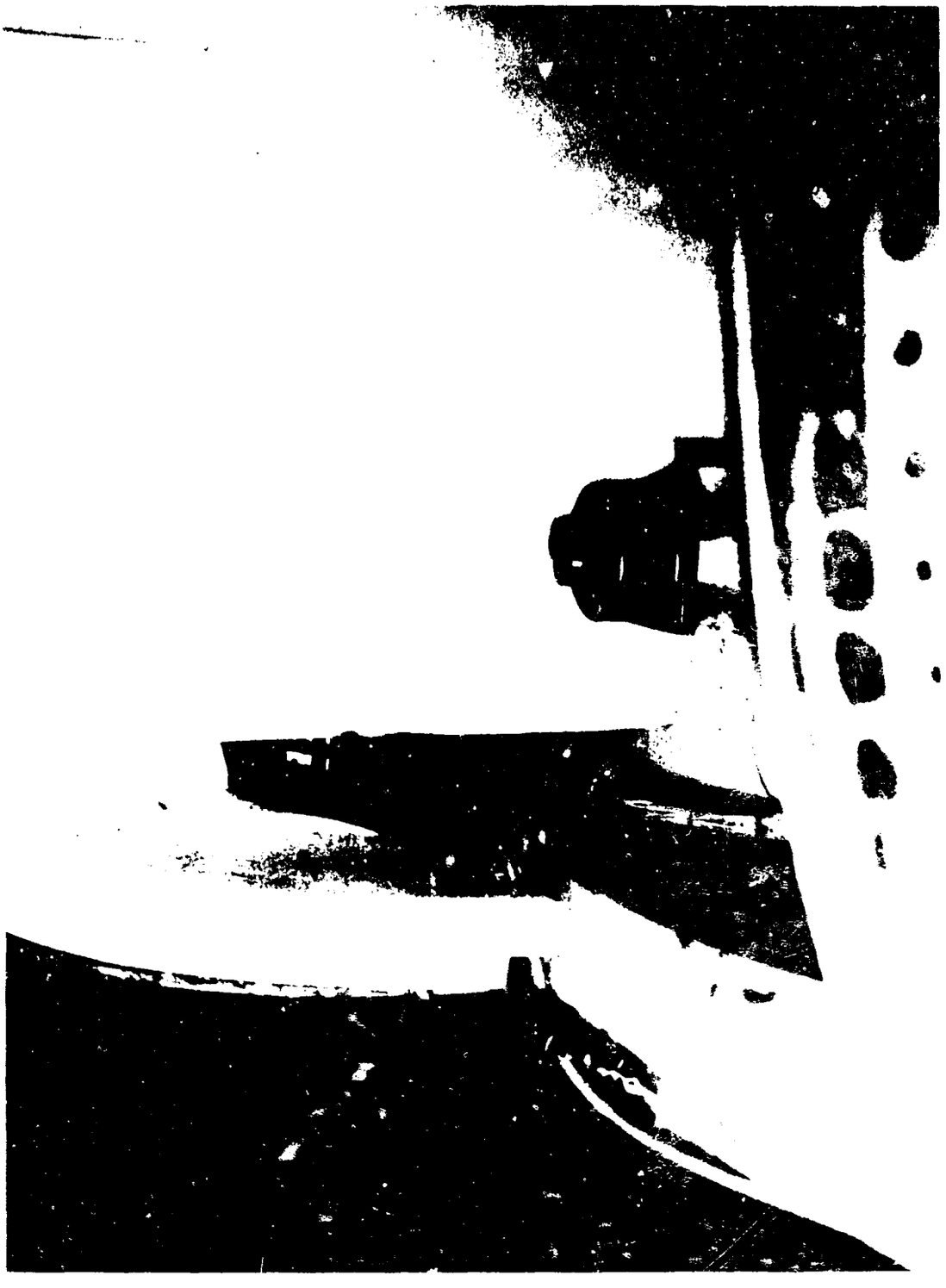
VIEW OF BULKHEAD NO. 1 INSTALLED IN AIG POD

PHOTO NO. 19

AIG POD ACOUSTIC TEST PROGRAM

VIEW OF BULKHEAD NO. 2

AIG POD ACOUSTIC TEST PROGRAM



VIEW OF BULKHEAD NO. 3 INSTALLED IN AIG POD

PHOTO NO. 21

AIG POD ACOUSTIC TEST PROGRAM

INLINE MUFFLERS NOS. 1 AND 2

AIG POD ACOUSTIC TEST PROGRAM

INLINE MUFFLER NO. 2 INSTALLED IN AIG POD

PHOTO NO. 13

AIG POD ACOUSTIC TEST PROGRAM

EXHAUST BAFFLE NO. 1 INSTALLED IN AIG POD

PHOTO NO. 24

AIG POD ACOUSTIC TEST PROGRAM

EXHAUST BAFFLE NO. 2 INSTALLED IN AIG POD

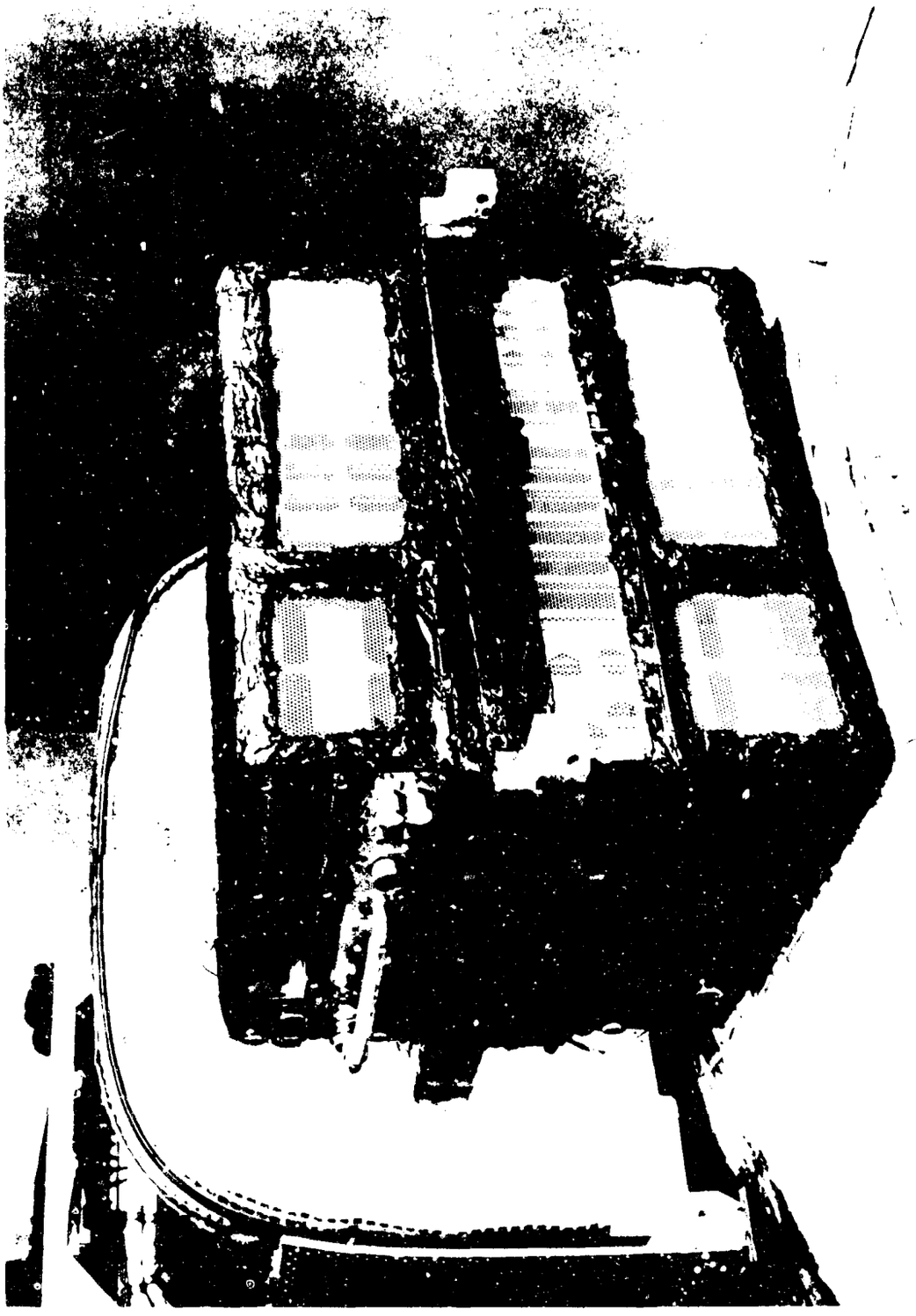
PHOTO NO. 25

AIG POD ACOUSTIC TEST PROGRAM

DOOR BULKHEAD NO. 1 INSTALLED IN AIG POD

PHOTO NO. 76

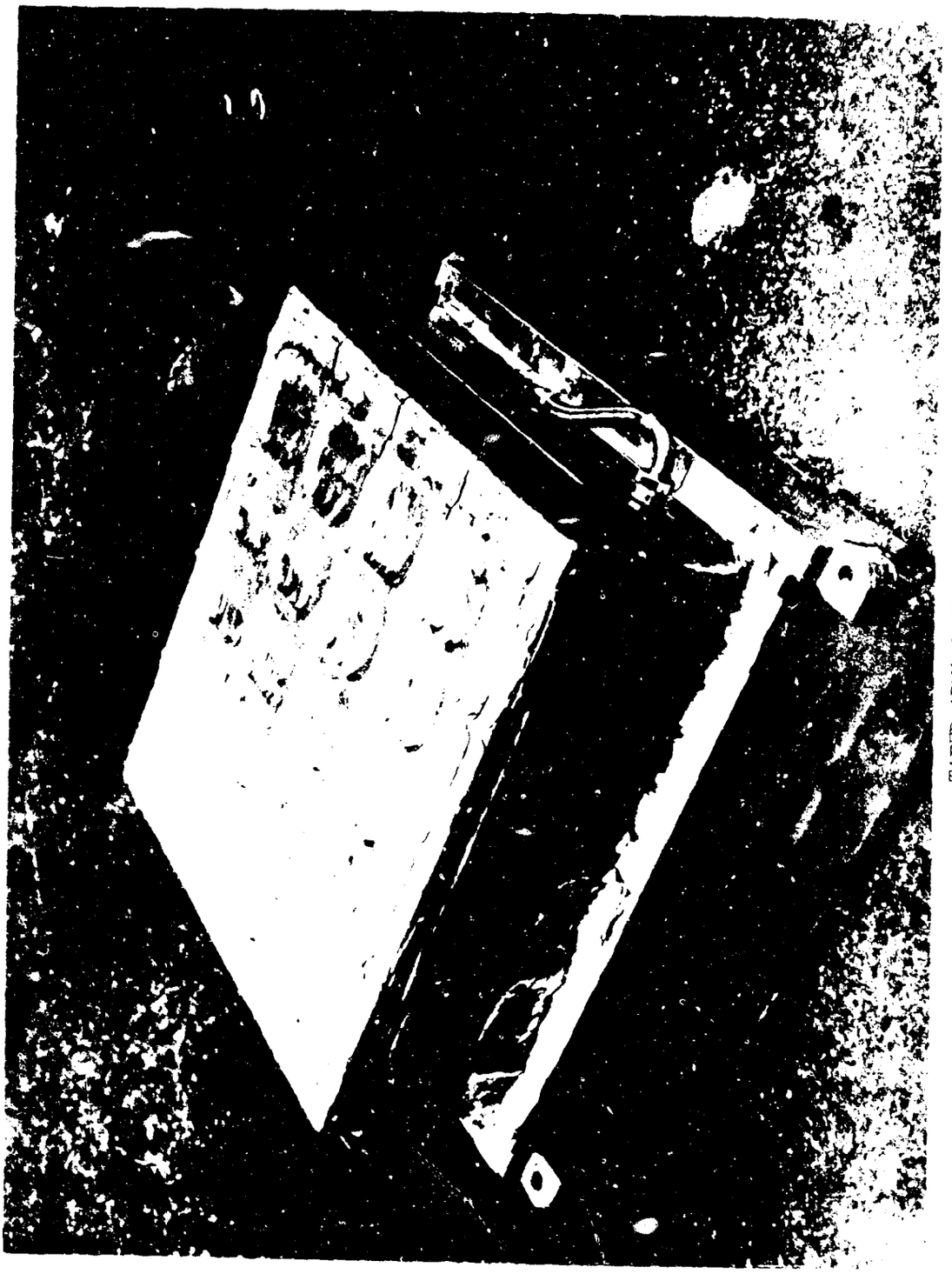
AIG POD ACOUSTIC TEST PROGRAM



TAPPED ARMA COMPUTER

PHOTO NO. 27

AIG POD ACOUSTIC TEST PROGRAM



TAPED ARMA COMPUTE

PHOTO NO. 23

GD

GENERAL DYNAMICS | ASTRONAUTICS